Water Scenario

Today 1.2 billion people do not have access to safe drinking water

Even though the rate of urbanisation in India is among the lowest in the world, the nation has more than 250 million city-dwellers. Experts predict that this number will rise even further, and by 2020 about 50 per cent of India’s population will be living in cities. This is going to put further pressure on the already strained centralised water supply systems of urban areas.

According to Central Public Health and Environmental Engineering Organisation (CPHEEO) estimates, as on 31 March 2000, 88 per cent of urban population had access to potable water supply. But this supply was highly erratic and unreliable. Transmission and distribution networks are old and poorly maintained, and generally of a poor quality. Consequently physical losses are typically high, ranging from 25 to over 50 per cent. Water is typically available just for few in a week in most Indian cities. The situation worsens in summer when water availability is reduced considerably.

According to a World Bank study, of the 27 Asian cities with populations of over 10,00,000, Chennai and Delhi are ranked as the worst performing Metropolitan cities in terms of hours of water availability per day, while Mumbai is ranked as second worst performer followed by Kolkata.

In most cities, centralised water supply systems depend on surface water sources like rivers and lakes. Chennai, for instance, is dependent on water storage in three lakes around the Metro, whereas Bangalore gets its water from the Cauvery river, which is 95 km away. Where surface water sources fail to meet the rising demand, groundwater reserves are being tapped, often to unsustainable levels. It is estimated that more than 50 per cent of the population of Chennai and Bangalore is dependent on groundwater.

Aerator and Clariflocculator at Hubli-Dharwad Water Supply Project
A grim scenario

As Summer comes to India every year, along with it comes water crisis, because wells, ponds and taps dry up, women begin to walk the village streets and city roads with pots and pitchers looking for a water-point. As Municipality water-tankers and Government-run water trains begin to traverse the length and breadth of the country, people gather on street corners, village squares and in front of Municipality offices and make protests, demonstrations, road-blockades, riots etc.

Today, nearly 1.2 billion people do not have access to safe drinking water. As per the projections of the World Water Assessment Program, undertaken by 23 United Nation agencies, the average supply of water per person is expected to drop further by a third in the next 20 years. The programme projects that, by the middle of this century, at least 2 billion people in 48 countries and, at worst, 7 billion in 60 countries – depending on factors such as population growth and climate change – will face acute shortage of water.

Faced with poor water supply services, farmers and urban dwellers alike have resorted to helping themselves by pumping out groundwater through borewells. Today, 70 percent of India’s irrigation needs and 80 percent of its domestic water supplies come from groundwater. Although this ubiquitous practice has been remarkably successful in helping people to cope in the past, it has led to rapidly declining water tables and critically depleted aquifers, which are no longer sustainable.

World Water Vision

At the international level, the WWC (World Water Commission) is spearheading the campaigns and programmes to monitor and manage water resources, taking into consideration the world’s water needs in the 21st century. To that effect, the WWC has prepared the World Water Vision and a Framework for Action. Apart from pushing governments to act now, it has created an environment where the private sector can also participate in the process, bringing in more transparency and effectiveness.

India faces a turbulent water future. Unless water management practices are changed – and changed soon – India will face a severe water crisis within the next two decades and will have neither the cash to build new infrastructure nor the water needed by its growing economy and rising population.

Gearing up for tomorrow

Importantly, India cannot have a secure water future unless there are drastic changes in the way the state functions. Past attention to infrastructure development has to be complemented with present
attention to water resources and infrastructure management. And, policies and practices have to come to grips with the challenges of the future.

Though, there are large variations in rainfall from region to region, season to season and year to year, the spatial and temporal variations in precipitation have led to complex situations such as the distinctly different monsoon and non-monsoons, the high and low rainfall areas and drought-flood-drought syndrome due to numerous factors. As the overall demand for water in 2025 would be close to the total water available, the National Water Policy of Government of India stresses the urgent need for conservation of water with the objective to foster efficient utilisation of water.

The demand for community water supply in urban as well as rural areas in 1990 was about 25 cu.km. which increased to 33 cu.km. in 2000 and is expected to be around 52 cu.km in 2025 due to growth in population, as also due to improved life style of the people. Therefore, the National Water Policy has accorded top priority to Drinking Water Supply in the allocation of water resources for various beneficial uses. It is, therefore, very necessary to make long-term planning of water resources management for a period of 30-40 years ahead by National and Provincial Governments by preparing Water Resources Management Master Plans and implementing the same effectively.

Due to fast growing urbanisation and industrialisation and diminishing water resources, it has become imperative to conserve available water to the maximum extent possible by systematically taking various measures like leak detection and rectification works, rain water harvesting, controlling indiscriminate extraction of ground water and recharging of aquifers. By adopting these measures, states could improve the ground water resources substantially.

Assuring long-term protection of existing potential water resources and maintaining adequate supply of potable water are important goals of Water Supply Plan. Every government and social service organizations are very much concerned with this and steps are taken to provide the public with clean and safe drinking water. This needs a multi-pronged approach
which includes comprehensive services such as: protecting potential water resources, controlling indiscriminate extraction of ground water, appropriately treating raw water, and ensuring safe distribution of treated water to consumers.

Since supply of safe drinking water is a continuous requirement, high emphasis has to be laid on every aspect of construction namely – planning, design, execution, operation & maintenance management. This also needs identification of sources of water supply, their conservation, source water assessment & protection (SWAP), treatment, transmission, storage and distribution as well as optimal utilization of the same. A good operation and maintenance will minimize the unaccounted for water (UFW) and improve the performance of public water supply systems.

N. Sureshkumar
General Manager & Head
Water & Utilities BU
Water - The Gift of Life

The earth is covered by 1400 million Cu.km of water

About three fourth of earth’s surface is covered by water. According to an estimate the total amount of water on earth is about 1400 million cubic kilometres (m.cu.km) enough to cover the earth to a depth of 3 km. However, fresh water constitutes a very small proportion of this enormous quantity. About 2.7 per cent of the total water available on the earth is fresh water of which about 75.2 per cent lies frozen in polar regions and another 22.6 per cent is present as ground water. The rest (2.7%) is available in lakes, rivers, atmosphere, moisture, soil and vegetation. What is effectively available for consumption and other uses is a small proportion of the quantity available in rivers, lakes and ground water. The crisis about water resources development and management arises because most of the water is not available for use and is characterised by highly uneven spatial distribution. As such, the importance of water has been recognised and there is greater emphasis being laid on its economical use and better management.

Composition

As water is a universal solvent, pure water rarely occurs in nature. In its movement on and through the earth’s crust, water reacts with minerals in the soil and rocks. Ground-water contains sulphates, chlorides and bicarbonates of sodium and potassium and the oxides of calcium and magnesium. Surface water may also contain domestic sewage and industrial wastes. Ground water from shallow wells may contain large quantities of nitrogen compounds and chlorides derived from human and animal wastes. Some supplies of natural drinking water contain flourides in varying degrees. The proper proportion of flourides in drinking water has been found to reduce tooth decay.

Seawater contains, in addition to concentrated amounts of sodium chloride, or salt, many other soluble compounds. At the same time, pure water is continually lost through the process of evaporation, and as a result the proportion of the impurities that give the oceans their saline character goes up.

Drinking water

Constant supply of clean drinking water is essential for every human being and other living organisms. The drinking water that is available on the tap, for people in large cities...
and towns comes from the surface water sources, such as lakes, rivers and reservoirs including ground water pumped through borewells. Very often, these sources are close to the community. Sometimes, they may be located many miles away. In rural areas, people mostly use either well water or surface water.

Major water supply systems draw surface water through special intake pipelines or canals and transport it to the area of use through aqueducts. These feed a system of smaller conduits or pipes that take the water to its place of use.

Water purification

Water supply projects consist mainly of pumping stations, treatment plants, storage facilities and distribution lines. Treatment plants are places in which water will be coagulated, settled and filtered to remove suspended impurities, aerated to remove dissolved gases, and disinfected with chlorine, ozone, ultraviolet light, or some other agent that kills harmful bacteria and microorganisms.

Suspended and dissolved impurities present in naturally occurring water make it unsuitable for many purposes. Objectionable organic and inorganic materials are removed by methods such as screening and sedimentation; treatment with compounds such as activated carbon to remove tastes and odours; filtration and chlorination or irradiation to kill infective microorganisms.

In aeration (saturation of water with air), water is brought into contact with air to produce maximum diffusion, usually by spraying water into the air in fountains. Aeration removes odours and taste caused by decomposing organic matter, and also industrial wastes such as phenols and volatile gases such as chlorine. It also converts dissolved iron and manganese compounds into insoluble hydrated oxides of the metals which may then be readily settled out.

Hardness of natural water is caused largely by calcium and magnesium salts and to a small extent by iron, aluminium, and other metals. Hardness resulting from the bicarbonates and carbonates of calcium and magnesium is called temporary hardness and can be removed by boiling, which also sterilises the water. The permanent hardness or residual hardness caused by calcium and magnesium salts can be softened by the addition of sodium carbonate and lime filtration through natural or artificial zeolites which absorb the hardness-producing metallic ions and release sodium ions to the water.

Desalination

To meet the ever-increasing demand for fresh water, especially in arid and semiarid areas, much research has gone into finding efficient methods of removing salt from seawater and brackish waters.

Three of the processes involve evaporation followed by condensation of the resultant steam
and are known as multi-effect evaporation, vapour-compression distillation, and flash evaporation. The last-named method, the most widely used, involves heating seawater and pumping it into low-pressure tanks, where the water abruptly vaporises (flashes) into steam. The steam then condenses and is drawn off as pure water. In 1967, Key West, Florida, opened a flash-evaporation plant and thus became the first city in the U.S. to derive its fresh water from the sea.

Freezing is an alternative method, based on the different freezing points of fresh and salt water. The ice crystals are separated from the brine, washed free of salt and melted into fresh water. In another process, called reverse osmosis, pressure is used to force fresh water through a thin membrane that does not allow the minerals to pass.

**Pollution**

In many water systems, pollution exceeds safe levels. One reason for this is that much ground-water has been contaminated by waste disposal or by seepage from surface waste water. When contamination reaches underground water tables, it is difficult to correct and spreads over wide areas. In addition many communities discharge untreated or partially treated sewage into the waterways, threatening the health of their own and the neighbouring population.

Along with domestic wastes, sewage carries industrial contaminants and a growing tonnage of paper and plastic refuse. Although sewage treatment would destroy most disease-causing bacteria, the problem of the spread of viruses and viral illness remains.

**Sewage / effluents treatment**

The biochemical processes that take place in water bodies have also been relied on to neutralize sewage. Aerobic, or oxygen-requiring, bacteria feed on the organic material in sewage, decomposing it. However, this process uses the oxygen that is dissolved in water. Often the concentration of organic waste is so great that the biological oxygen demand (BOD) depletes the water’s oxygen supply, killing fish and plants. In order to avoid these problems, it is now recognized that all sewage except unmixed storm water must be treated before it is discharged.

Sewage treatment is classified as primary, secondary, or tertiary, depending on the degree to which the effluent is purified. Primary...
treatment is removal of floating and suspended solids. Secondary treatment uses biological methods such as digestion. Tertiary treatment removes almost all bacterial and organic matter to make it fit for re-use.

Industrial wastes are treated by a number of methods, depending on the specific nature of waste. Increasingly, governments are forcing industries to process effluents either chemically or biologically, or both ways, so that harmful substances are removed.

Privatizing Infrastructure

Water-supply systems in metros, major cities, towns and municipalities face serious problems associated with capital deterioration, deferred maintenance, unreliable water supply, and underpricing of services.

As almost all municipal water-supply systems, are publicly owned and operated, they face little capital-market competition and generally lack incentives to operate efficiently.

Privatization in the form of long-term, competitive-franchise agreements or BOT, BOOT, BOLT schemes can generate incentives for efficient water-supply system management. France currently uses the franchise model to provide water to over 75 percent of its population. The United Kingdom now provides water to nearly 100 percent of its population through fully privatized water-supply systems. A growing number of other countries including Argentina, Australia, Chile and Italy are turning to similar privatization models to access private-sector operating expertise and investment.

In the United States, over 300 operation & maintenance contracts between private operators and municipalities are in the form of competitive franchising. These contracts, which generally run for five years, have achieved considerable cost savings. Contractual performance and cost guarantees enable municipalities to secure operation’s accountability. Removing state and federal laws that restrict the length of contracts would give private contractors more opportunity to make and finance capital improvements, and thereby increase potential cost savings.

Recognising the urgency and of ever increasing need for safe drinking water, United Nations has declared March 22 as Water Day, every year.

Governments all over the world are concerned about the depletion of natural water resources and the uneconomical use of water. Water summits are conducted by various organisations at National and International levels to create an awareness on all aspects of water, namely purification, conservation, exploitation and proper use of water without wastage, for water is the gift of life.

K. Sridharan
CCD, ECC - HQ, Chennai
ECC—the Construction Division of LARSEN & TOUBRO LIMITED, India’s largest construction organization, is also the country’s leader in Water Projects. ECC has a dedicated strategic business unit (SBU), which offers EPC services for projects in water sector covering:

a) Water transmission / distribution
b) Water treatment
c) Industrial effluents / waste water treatment and disposal
d) Rehabilitation of Pipelines

Known as Water and Utilities Business Unit, this SBU has been executing some of the major and critical Water transmission/distribution and Water treatment projects in India and abroad for various Metros, Urban, Municipal, and Rural customers including Public Sector undertakings and Private clients of repute.

**Services**

ECC’s long experience and expertise gained over a period of time has made it one of the leading players in India for developing and providing water infrastructure. It has a proven track record in offering wide range of services right from concept to commissioning of water supply systems, transmission and distribution, treatment of - water, sewage and industrial effluents as per required standards including conveyance and disposal of treated effluents both onshore and offshore.

ECC’s experience, expertise and wide presence is unparalleled in the industry. It offers a pragmatic and fiscally sound approach to the design, construction, operation and management of water and waste water services, encompassing the following:

- Feasibility studies
- Pre-engineering, detailed design
- Procurement and supply of plant and equipment
- Turnkey construction

A 120 MLD raw water treatment plant under construction at Panipat Refinery Project
• Quality assurance
• SCADA (Supervisory Control and Data Acquisition)
• Instrumentation and control systems
• Commissioning and start-up
• Operation and maintenance

In addition, it has forayed into water management and control systems with the execution of India’s largest “Leak detection and rectification” programme for Chennai Metro Water, followed by BWSSB Bangalore.

**Major Share**

ECC currently holds a market share of 20 percent in Water Supply projects in India, which is expected to grow steadily in the coming years. In order to keep itself abreast of the latest technological developments taking place in the world, it has entered into a long term collaboration with International agencies for technology transfer, know-how and providing other leading edge services viz. Zero discharge systems, R O plants.

**International Standards**

ECC has specialised team of engineers with process and environmental engineering background for providing suitable process systems / schemes to meet varying and ever increasing customer requirements and standards stipulated by CPHEEO (Central Public Health and Environmental Engineering Organisation) / WHO.

7.5MLD sewage treatment plant in Ramanagaram
Providing environment friendly and affordable solutions, with international benchmarks of quality, speed and economy are the hallmarks of ECC’s success in Water sector.

**Engineering Design**

Yet another unique feature of ECC is its capability to offer multi-disciplinary engineering, design and comprehensive construction services - all from a single window. The Engineering Design and Research Centre (EDRC) at ECC headquarters, Chennai, offers innovative and cost effective solutions apart from devising modern construction methods, planning and providing other value added services to all its customers.

EDRC undertakes all essential design assessments and procedures using latest software in civil and piping designs. Detailed Engineering offered include detailed design and drawings encompassing civil, electrical, piping and instrumentation & control systems for water intake, transmission, treatment and distribution including surge protection system. This apart, ECC offers detailed piping stress analysis for pipe on hillock and pipe support schemes including preparation of schedules based on the analysis.

**Privatisation**

ECC’s strategic plan, targets core water and waste water business through strategic alliances, public - private partnerships either with government bodies or local municipalities or even for private entrepreneurs for expanding its existing services and territories. Our mission, above all, is to provide customers with safe and clean drinking water, meeting world health and safety standards.

V. Kandasamy

_DGM (Process)_

*Waste water treatment plant at Mahul for Bharat Petroleum Corporation Limited*
Sri Sathya Sai Water Supply Projects
Covering three Districts - 1051 villages & a population of 10.8 million

For millions in Rayalaseema and Telengana Regions of Andhra Pradesh, getting pure drinking water was a daily drudgery. It meant trudging long distance, often in vain.

Sri Sathya Sai Central Trust decided that the villagers need never again trek for something which ought to be on their taps and proposed the SRI SATHYA SAI WATER SUPPLY PROJECTS covering more than 1000 villages in Ananthapur, Medak and Mahabubnagar districts and providing water to more than two million people who had lived all their lives on the edge of drought and despair.

This was a dream turned into reality, as safe drinking water flowed into the parched districts of Ananthapur, Medak and Mahabubnagar. Sri Sathya Sai Central Trust made it possible. Bhagwan Sri Sathya Sai Baba reached out to the neglected villages with a sense of urgency, and the project was completed with speed and efficiency, thanks to the commitment and spirit of service displayed by various agencies.

Ananthapur

In November 1994, the Trust began its mission in Ananthapur. The Panchayat Raj department of Government of Andhra Pradesh moved quickly, submitted plans for providing drinking water to more than 700 villages and urban centres such as Ananthapur, Kadiri, Dharmavaram as indicated by Bhagwan Sri Sathya Sai Baba. Construction of this massive project was entrusted to ECC.

Four Schemes

Sri Sathya Sai Water Supply Project at Ananthapur consists of four schemes:

• Comprehensive Protected Water Supply Schemes involving infiltration wells, collection wells and associated pumping behind the Chirtavati Balancing Reservoir at Peddakotla and Chinnakotla villages covering 169 villages. Sources for other infiltration wells include Pennar and Hagari river covering 93 villages.

• Direct pumping from Penna Ahobilam Balancing Reservoir (PABR) and treatment through rapid sand filtration system. This consists of two major lines passing through Kalyandurg and Atmakur covering 93 villages.

• Comprehensive Protected Water Supply Schemes (CPWS) through seven summer storage tanks ranging upto 100 acres by tapping water from Tungabhadra High Level Canal, covering 97 villages.

Water Treatment Plant at PABR for Sri Sathya Sai Water Supply Project at Ananthapur
• The Protected Water Supply (PWS) Scheme covers 279 villages. It involves drilling deep borewells, construction of storage tanks and installation of pipeline networks.

Thus, the Sri Sathya Sai Water supply Project came into being as a collaborative effort of Sri Sathya Sai Central Trust, the Government of Andhra Pradesh and ECC.

It was Bhagwan Sri Sathya Sai Baba who brought these three distinctly different organisations together. He inspired them to work with a unity of purpose and harmony of thought.

Significant features that characterise the uniqueness of this project include:
• The stringent time frame
• The vast magnitude
• Project cost funded by a charitable organisation

**Salient Features**
- Laying of more than 2000 km of AC, CI, DI, MS and PVC pipelines. Diameters ranging from 80 mm to 600 mm
- Construction of 43 sumps from 1 lakh to 25 lakh litre capacity
- Construction of 18 balancing reservoirs at the top of hillocks with capacities ranging from 3 lakh to 10 lakh litres
- Construction of 270 overhead reservoirs. Capacities ranging from 40,000 litres to 3,00,000 litres
- 125 ground level reservoirs. Capacities ranging from 20,000 litres to 80,000 litres
- Installation of more than 1500 precast concrete cisterns of 2500 litres capacity, with provision for four taps to be used by the villagers

**Medak & Mahabubnagar**

Medak & Mahabubnagar are two districts of Telengana region in the state of Andhra Pradesh, which are drought prone and fluoride-affected due to erratic rainfall and over-exploitation of the ground water. Mahabubnagar district is situated on the western part and Medak district is situated in northwest central part of Andhra Pradesh.

Bhagwan Sri Sathya Sai Baba willed that pure and safe drinking water should be made available to the people of these districts and launched the Sri Sathya Sai Water supply project during March 1999. The Government of Andhra Pradesh, realising the importance of the project, immediately came forward to supply raw water from various sources like Krishna River in Mahabubnagar District & Manjeera River, Haldivagu stream and H.M.W.S.S.B. Mains in Medak District. This apart, the government also agreed to provide the land for putting up various civil structures, electrical power for operating the schemes and also extending administrative and technical support to the Trust.

The project envisaged providing drinking water to 145 villages in Mahabubnagar and 175 villages in Medak districts. This was achieved by providing 12 comprehensive protected water supply (CPWS) schemes covering 250 villages and individual protected water supply (PWS) Schemes for 70 villages with bore wells as source.
This project involved construction of civil structures like water treatment plants, over head reservoirs, sumps, ground level reservoirs, pump houses, pipeline laying and commissioning including Project Management Services for the execution of mechanical & electrical works. The total length of pipeline is approx. 800 km involving various types of pipes such as AC, PVC, HDPE, PSC, GI and MS of varying diameters ranging from 63 to 600 mm.

Work commenced in May 1999 and 77 villages were commissioned by 23rd November 1999 i.e., 74th birthday of Bhagwan Sri Sathya Sai Baba. Similarly a total of 290 villages were completed by 23rd Nov 2000 i.e., his 75th birthday.
The Sri Sathya Sai Water Supply project is a landmark project in terms of magnitude, scale, diversity and coverage. Millions of people are benefitted through this massive water supply project of National importance.

The success of a project does not end with mere execution of same. The real success lies in its flawless operation continuously over a long period of time.

This is not possible without a proper service and maintenance of the systems. Where the project is spread over vast distances, maintenance is all the more difficult. And, that is why L&T has been pressed into service for the O&M of Sri Sathya Sai Water Supply Project. Here below we would like to share our experience of O&M in this project.

**Control**

With centralised co-ordinating Office (CCO) at Ananthapur the entire O&M Operations including deployment of P&M are controlled through seven zones located at Dharmavaram, Mudigubba, Tadipatri, Gooty, Bukkarava Samudram, Atmakur, Kalyandurg.

---

**Comprehensive Protected Water Supply Schemes (CPWS)**

- **Infiltration wells**
  - Major wells at: CBR – Parnapalli and Puttaparthi
  - CBR – Chinnakotla, Mudigubba and Kadi
  - Other well locations: Sajjadinne, Ravivenkatampalli, Peddapappur, Kallur-Garladinne, Theetakal, Budimepalli, Konduru, Gooty, Rayalacheru

- **Summer Storage Tanks**
  - BK Samudram-I
  - B.Pappur
  - Konakondla
  - Gadekal
  - Godesalpalli

- **Penna Ahobilam Balancing Reservoir**
  - Atmakur
  - Kalyandurg

---

**O&M – A continuous process**

O&M work involves running the schemes for 16 hours a day and maintaining the entire system (consisting of pumpsets, pipelines, valves and other accessories) round the clock. Following are the procedures involved:

i) Continuous monitoring of all the parameters at Pumphouses

ii) Preventive maintenance of pumpsets

iii) Prompt detection and arresting of leakages

iv) Cleaning of sumps/ facilities

v) Certification of water supply
Objectives of Operation and Maintenance

1. Minimum loss of precious drinking water.
2. Avoid contamination of water.
3. Maintain stable line pressure and improve tail end supply.
4. Increase end-user satisfaction.
5. Increase in revenue to client.
7. Reduction of power consumption and chemical cost.
8. Safety for men and machinery.

Mode of Operation

CCO (Centralized Coordinating Office) coordinates in between Zones and client.

1. The instructions are collected from clients and passed on to Zones with Action Plan.
2. Daily monitoring of day-to-day activities.
3. Improvements are highlighted to clients for approval and realization.
4. Problems at site are highlighted to clients for necessary action.
5. Analyzing survival period of sources for all schemes.

Zonal Offices

1. Ensure daily water supply to all habitations with quality and stipulated quantity.
2. Maintain men and machinery for smooth functioning of the schemes.
3. Identify improvements to save cost, improve quality, cycle time, customer satisfaction and safety.
4. Send samples for various tests to ensure quality of drinking water.
5. Schedule pumping with respect to power availability.
6. Report and implement instructions in case of illegal and unauthorized tap connections in villages.

Modus Operandi

Pump Operation

Since pumping for all schemes is done for more than 16 hours, round-
the-clock pumping operation is necessary. Experienced pump operators are posted on all pump houses to facilitate this. They take care of safe pump operation and maintaining required water levels in sumps for further pumping. They also maintain the records for analysis.

**Leakage Inspection, Rectification**

Experienced riggers travel along the pipeline route by bicycle, identify leakages and inform the pump house concerned and site engineer for rectification.

**Daily Water Supply**

An experienced operator travels from the pump house by bicycle above the pipeline, operates the branch line valve and fills the reservoir meant for a particular village. This operator carries out:
- identifying leakages, if any, in distribution pipeline and wastewater management.
- chlorinates water in the facility and distributes through tap points.
- cleans the facility once in a fortnight and sumps once in a month.
- collects the certification for supply of water from the village authorities.

After completing his activities in one village he moves to the next. An operator covers three to four villages this way in a day. The other operator starts for the next set of villages.

**Pipeline Maintenance**

As soon as a leak or pipe burst is noticed, the rectification gang led by the site engineer rushes to the spot for plugging the leak or replacing the pipe to ensure uninterrupted supply of drinking water.

**Preventive Maintenance**

Trained electrical and mechanical technicians follow and carry out preventive maintenance to keep all pumps and motors along with its accessories in good condition to ensure uninterrupted functioning of the system. All necessary records are maintained for further reference and analysis.

**ISO Certification**

ISO 9001:2000 has been in place at this O&M site since 2003 and till date no major non-conformity has been reported, a testimony to ECC’s quality consciousness.

On the safety front, ECC has achieved seven million safe manhours, a Jewel in our Golden Crown.

As the job is repetitive in nature, it has been possible to analyse various aspects of the system periodically and bring about changes/improvements, some of which are listed below, that will ultimately benefit the public.

1. Changing impeller size
2. Shifting of transformer to right location

*Main trunkline from PABR*
iii) Providing infiltration gallery in river beds
iv) Mesh to landscapes
v) Change in dimensions of pipelines
vi) Additional tap points
vii) Extensions of distribution pipelines

**Difficulties Faced**

1. Maintenance of pipelines like pipe burst, leakages to be attended to on a war footing basis. As the lines are spread for a length of more than 2000 kms, maintenance works to be carried out regularly.

2. Irregular power disturbances affects all our supply schedules and we should be always alert to reschedule and prioritize.

3. Scarcity of water at source especially in summer needs plannings for more supply with minimum losses.

4. Illegal and unauthorized tap connections at villages.

5. Sabotage from public.

   A dedicated team attends to the above problems, analyses the tasks, follows up with CCO for deployment of resources if any and even rerouting the pipeline (if need be) to overcome the problem.

**Improvements made**

1. In PABR Water treatment plant, the rail for rotating arm of clariflocculator was found to be deviating from the center axis due to heat, resulting in frequent breakdowns. To overcome the same, additional flat arrangement as arrester was provided on both ends and the center of individual rails. This helped the clariflocculator rotating arm function as designed.

2. Approach ladder for OHSR at top had no platforms for landing and this meant potential for accidents. ECC brought the matter to the notice of the Board and with their consent, provided a landing platform for all the existing ladders in a phased manner.

3. Separate Holding arrangement from the column pipe was made for the 3 Raw water submersible pumps at PABR H/W to prevent the pump and motor from falling into dam. If fallen the retrieval cost will be huge and requires specialized labours including Divers and sinkers.

4. Separate casing arrangements done for 3 Raw water submersible motors at PABR H/W to avoid nets being used by fishermen in dam getting stuck in between rotating parts, thus leading to burning of windings in the motor.

5. After studying the existing arrangements and analyzing the performance (water requirement, hydraulic statements, line losses, etc.) at Atmakur Pump House, two 15 HP pumps were replaced by one 20 HP pump of same head. This brought down power consumption as well as power charges for client.

6. Gratings for facility outlets were additionally provided to present any foreign material from entering and choking the pipeline or tap points.

7. Climbing arrangement made for all Cisterns to avoid fall of lineman while climbing for mixing Bleaching powder into facility.

8. De-silting, providing metal strainers, invert filters, radial gallery, digging filter points in riverbed and inside IFW’s resulted in continuous uninterrupted supply of water to villages. De-silting was done in all IFW’s and collection wells while metal strainers, invert filter, radial gallery and filter points were provided at Peddakotla, Chinnakotla, Theetakal, Pamidi etc. At R.V. Palli-B scheme, filter points were provided inside IFW.

9. New drains were used on sumps lying above ground helped in easy draining of sumps for cleaning purpose whereas earlier
dewatering pumps and compressors were used.

10. At Vemalpadu, following an analysis of daily water requirement, hydraulic statements, line losses, etc. pipes of 150 dia were replaced by 200 dia pipes in a canal crossing. This led to total elimination of leakages, which used to be quite frequent in the past. The line discharge also went up from 750 lpm to 1070 lpm.

11. In Gooty pump house, the suction for 75 HP pump was modified using thinner flaps for foot valves which resulted in increasing the discharge from 86 cu.m per hour to 120 cu.m per hour.

12. Power fluctuations were frequent at Peddakotla, Mudigubba, Kalasamudram, Midthur, Nallamada, Gollapalli and Lakkasamudram. This problem was overcome by use of stabilizers (Servo make).

13. To increase the survival period and to maintain continuous water supply to villages, filter points were drilled in riverbeds of IFW schemes.

14. The pumps at various locations were re-deployed depending on their capacity and the requirement of each location. This measure brought about increased pumping discharge, energy savings and reduction in daily pumping hours.

15. By providing a tapping on raw water line to filter bed at B. Pappur, pumping from off take well was reduced for four months when water was there in the canal.

16. Vacumm pumps were installed at locations where pumping was getting affected due to sump filling time to maintain minimum water level. This resulted in increasing the performance of pump sets.

17. Laying of gravity line from IFWs to collection well along with radial gallery around pipe increased the water tapping at Chinnakotla.

18. De-silting and providing metal strainers in all IFWs increased the quality of water and yield at Chinnakotla, Peddakotla, Gooty and Theetakal schemes.

19. Drilling of weep holes in IFWs increased yield in Chinnakotla and Peddakotla.

20. An approach platform for lifting arrangements at Chinnakotla collection well was provided as a safety measure.

21. Hydraulic statement was analysed and a new pipeline laid for Cheruvandalapalli village in Mudigubba scheme and Naggiredypalli. This resulted in reducing pumping time and increased discharge.

P. R. Harikrishna
Resident Engineer

T.S. Muralidharan
Planning Engineer
Sri Sathya Sai Central Trust took up this project to provide drinking water to the people of Chennai City. The total length of the Sai Ganga Canal from Somasila Dam to Poondi reservoir is 200km. Till recently the required quantity of drinking water let into the canal was not reaching Chennai due to heavy leakage, damages and breaches at various points. Experts from Sri Sathya Sai Central Trust, Irrigation Department of the Government of Andhra Pradesh and L&T, under the leadership of Mr. R. Kondala Rao, inspected the canal periodically when water was in full flow, to investigate the losses due to leakage. Following these investigations the Sai Ganga Canal project was launched and L&T were appointed turnkey contractors.

The major works involved in the Project were:

- Improvement works of Kandaleru Reservoir
- Grouting works of Kandaleru Reservoir cutoff wall
- Easening of slopes at Approach Channel and Sai Ganga Canal
- Concrete lining in Sai Ganga Canal at vulnerable locations
- Construction of Escapes & Regulators at three different locations
- Other miscellaneous structures and improvements

The major items of plant & machinery deployed at various locations were:

- Batching Plant (9m³, 10 m³, 15 m³, 20 m³, 30 m³, 36 m³) - 9 nos.
- Transit Mixers - 39 nos.
- Concrete Paver with rails - 19 nos.
- Road Rollers (10 Ton) - 10 nos.
- Vibromax - 07 nos.
- Power Generator (25KVA, 40KVA, 62.5KVA, 125KVA) - 41 nos.
- Compressor with all accessories - 15 nos.
- Rock Breaker - 03 nos.
- Wagon Drill - 03 nos.
- Excavator (one with 14m long boom) - 19 nos.
- Tippers - 70 nos.

**Improvements at Kandaleru Dam**

The job involved the following major works:

- Rough stone revetment of 70,000 cu.m. of size varying from 225 mm to 450 mm on slopes 1.5:1, height varying from 20 m to 46 m.

*Escape regulators on the Sai Ganga approach canal*
• Laying of 0.5 mm thick geotextile filter media of 13,800 sq.m.
• 4,000 cum of Gabion placed along the length and across to form panel walls and protect the revetment stones from the wave forces of water.

Rough stones of size 225 mm and 300 mm were filled in the eroded parts of the earthen dam. Further 450mm stone slabs were placed to protect the entire inside dam portion wherever left out during earlier stages. This was done to increase the storage capacity to 67 TMC in the Reservoir (FRL).

A quartzite stone quarry was established 25 km from Kandaleru Reservoir. The job was completed within a short duration of effective 150 working days. The most critical part of the work was the approach to inside of the dam which was through two ramps located 6 km away from each other and the bund width of which was 4.50 m.

**Sai Ganga Approach Channel**

The work involves widening of deep cut portion of the mouth of Kandaleru Reservoir upto Head Regulator for a length of 700m out of 3200m.

The existing canal having a deep cut of 20 – 24 m in ¼: 1 slope was getting eroded and caving into the canal during monsoon. Since the soil strata were a combination of gravelly earth, shales, sheet rock, soft disintegrated rock, hard rock etc, the soil at certain areas when in contact with water, softened and dissolved, causing erosion of the bunds.

To overcome the above, the canal was widened to 1.5:1 slopes and protected with weld mesh reinforced cement concrete (1: 3: 6), 70 mm thick by guniting method. The entire soil strata were bolted with anchor rods of 20 mm dia, 1.5 m depth. Apart from easing of slopes, the entire top portion of the bund was to be protected as otherwise the entire area would be submerged when the reservoir becomes full.

**Major quantities of work involved were:**

- Excavation in all types of soil : 2,00,000 cu.m
- Hard rock : 38,000 cu.m
- Guniting : 48,000 sq.m

**Head Regulators**

Similar work as in Approach Channel was carried out in Sai Ganga Canal chainage 0.2 – 0.6 km due to the nature of the soil strata and also to keep the canal in straight line to avoid the impact load of water when the Regulators are opened.

**Major works involved were:**

- Excavation in all types of soil : 60,000 cu.m
- Hard rock : 40,000 cu.m
- Guniting : 8,500 sq.m

**Concrete Lining**

Due to heavy leakage, erosion and breaches at several places, the water let into the canal from Kandaleru – only 3 TMC out of designed 10 TMC - was reaching the destination (Poondi Reservoir).

65 km of concrete lining was taken up in different identified stretches over a length 152 km of the canal. Cement Concrete lining of 100mm thick of M15 grade with Canal pavers (self-spreading / compacting & frictionless smooth finishing ) using PP Cement on the bed and side slopes of the canal to arrest seepage / leakage and also to increase velocity of flow. Guniting with weld mesh reinforcement was also done in the portion of Hard rock.

Completed view of the Sai Ganga Canal
Random rubble masonry and rough stone revetment works were carried out at vulnerable reaches where heavy erosions and breaches occurred. Cement concrete lining was done in canal of bed width varying from 5.5m to 29.0m and slope length varying from 8m to 14m.

**Major quantity of works involved were:**

- Earth work in excavation: 8,00,000 cu.m
- Filling with Gravel: 5,00,000 cu.m
- C C Lining: 1,75,000 cu.m
- C C Guniting: 1,70,000 sq.m

**Escapes and Regulators**

Three numbers of Escape and Regulators were constructed at three different locations across the Sai Ganga Canal involving 14,290 cu.m. of concrete, 19 nos of Gate (210 MT) and embedments of 70 MT to (1) regulate the surplus waters during floods; (2) to safeguard the earthen canal bunds from breaches; (3) to take up repairs/maintenance in the canal; (4) and above all to regulate the flow of water into the nearby nallas during emergencies/surplus floods through the escapes.

**Miscellaneous Improvements**

Flume: During monsoons, the soil on the slopes is getting eroded and choked in the flume and canal portion. The scope involved widening of the slopes in deep cut portion, protecting the sides with stone masonry and provision of chute drains.

In the canal for about 1.00 km at the flume portion the deposited silt was saturated with subsoil water upto 1.50 m depth. Removal of the silt and slush was a difficult task where canal bed was 15m deep from the top of bund. The soil at this location was very hard but when it came in contact with water it softened and became loamy slush. Wellpoint dewatering system was deployed to overcome the difficulty in excavation to the designed bed level.

**Major quantity of works involved were:**

- Easening of slopes & excavation in bed: 30000 cu.m
- Stone masonry: 7500 cu.m
- Well point dewatering: 120000 HP Hrs
**Revetment in Canal**

The canal passes through some local tanks and lakes. The flooded water during monsoons enter the canal at lower levels, causing damage / breach in the bunds and leading to loss of water during summer when water is let into the canal from Kandaleru to Poondi through the weak bunds. To prevent this, vulnerable reaches were identified and protection works carried out in the form of stone masonry, rough stone revetment, grouting with cement concrete (1:2:4) and guniting.

**Major quantity of works involved were:**

- Stone masonry - 5,000 cu.m
- Rough stone Revetment - 20,000 cu.m

**Inlets & Chute Drains**

The water during rainy days from the hills and catchment areas was entering the canal from the bund top there by eroding the bunds - causing breaches and deposits of silt on the bed. To prevent this, vulnerable points were identified along the canal passing through hillocks. Cement concrete inlet structures and chute drains were constructed through catch drains letting the rainwater into the canal.

**Improvements in Flood Flow Canal**

Surplus water from Somasila Reservoir flows to Kandaleru Reservoir through open channel. Certain vulnerable stretches of the Somasila–Kandaleru Flood Flow Canal were to be protected from heavy erosion and deposition of silt by cement lining, guniting, stone masonry and rough stone revetment on the high embankment.

**Major quantity of works involved were:**

- C C Lining - 10,500 cu.m
- C C Guniting - 10,000 sq.m
- Stone masonry - 2,000 cu.m
- Rough stone Revetment - 10,000 cu.m

68456 tons of cement required for the project was issued free by Sri Sathya Sai Central Trust.

**Special Features of the Project**

- Usage of polypropylene sheet (geotextile) as filter media under dam revetment
- Usage of gabions (as renomatress) for revetment / panel wall
- Usage of high density polyethylene sheets as water tight membrane under cement concrete lining
- Grouting of dam cutoff wall for a depth of 75.00 m
- Guniting works with weldmesh reinforcement and rock bolting
- Pressure relief valves using porous concrete cylinders (plugs), perforated HDPE pipes surrounded with polypropylene sheet

ECC achieved eleven million safe man-hours during the execution of the project.

K. Masilamani
RPM (Water & Utilities), HYRO
Tirumala Water Supply Pipeline

4.5 million litres of water per day flows up Tirumala hills in two stages, over a total head of 763m water column (mWC) defying gravity and steep gradients. ECC executed this challenging task on EPC basis in a record time of 77 days.

Tirumala

Tirumala-Tirupati situated in Andhra Pradesh is one of the most ancient places of pilgrimage in India. Tirumala owes its existence to the sacred temple of the Lord of Seven hills, Sri Venkateswara. The Tirumala Hill is 3200 ft above sea level, and is about 10.33 sq. miles in area.

Every day several thousands of ardent devotees congregate at the temple. Amenities are provided by Tirumala-Tirupati Devasthanams (TTD) for their comfortable journey, stay and darshan.

Projects

ECC has been contributing significantly to TTD through major construction projects that serve millions of pilgrims visiting the temple. The list includes the famous ‘Q’ complexes, the Asthanamandapam and the administrative office building complex for TTD.

The crowning glory of these projects is the construction of a 4.5 million litres capacity water supply pipeline project covering a distance of 8.5 km. ECC took up this seemingly imposible task as a challenge and completed the work in 77 days, 13 days ahead of schedule. This landmark project provided a unique experience for more than 2500 staff and workmen as well as ECC’s vendors and associates.

Water Supply

The scope of this project covered pumping water from Kalyani dam gravity main to Tirumala hilltop by constructing ground level service reservoirs; pump houses, electrical sub-station, piping mains and accessories. This involved design, supply, installation, testing and commissioning of pipeline including erection of pumps with motors and surge protection equipment. The project was executed on total engineer – procure – construct (EPC) basis.

Salient Features

- An engineering, procurement and construction project completed by ECC in a record time

Completed view of the Tirumala Pipeline project
of 77 days - an unprecedented achievement as per Indian standards.

- The static level difference is 700m.
- 4.5 million litres of water per day to be pumped to Tirumala hills in two stages over a total head of 763 mWC from the existing gravity main along the Srinivasa Mangapuram - Srivari Mettu Road.
- The first stage involves pumping over a head of 205 mWC on almost continuously rising terrain.
- The length of pumping main is 8.5 km.
- The second stage involves pumping to a head of 558 mWC (56 kg/sq.cm pressure) on a hostile and steep terrain inaccessible for any kind of hi-tech plant and machinery. This is one of the largest pump heads installed for a water pumping station in India.
- Pumping of concrete through gravity - 250m downhill at 45-degree slope
- Water conveying system is of steel pipes of diameter 350 mm and 450 mm
- Pipe size was arrived at after extensive analysis of flow and velocity conditions. This size caters to the present as well as future requirements of flow.
- Detailed surge analysis was carried out for the system and a combination of check valve and air vessel provided as surge protection device.
- In view of frequent deviations, exhaustive piping stress analysis was carried out through computer simulation to arrive at forces acting on various piping supports. Location of anchor blocks and expansion joints was also decided on the basis of this analysis.
- The above-ground pipeline is supported on pedestals of 12-m span all along the hillock and the same is maintained at 6 m as the slope of the hillock increases.
- Conventional thrust blocks were employed in the design. Instead, unique guide supports are provided at bend locations. These supports are designed to absorb the pipe thrust forces and to act as a guide support for the pipe during expansion.
- Pipes are internally coated with epoxy of 100 micron DFT. Externally, underground pipes are wrapped with coal tar tape and above-ground pipes are painted with epoxy of 35-40 micron DFT.
- Complete design of the project - both basic and detailed engineering including the piping stress analysis was carried out by Engineering Design and Research Centre (EDRC) of ECC, Chennai.

### Schedule of 77 Day wonder

<table>
<thead>
<tr>
<th>Date</th>
<th>Event details</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 18, 1999</td>
<td>Project zero date (Bhoomi Pooja)</td>
</tr>
<tr>
<td>November 30, 1999</td>
<td>Freezing of design concepts and engineering</td>
</tr>
<tr>
<td>November 30, 1999</td>
<td>Procurement of high pressure valves, fittings, and pipes from Delhi</td>
</tr>
<tr>
<td>November 30, 1999</td>
<td>Mobilisation of 2500 unskilled workmen</td>
</tr>
<tr>
<td>January 27, 2000</td>
<td>Pumps &amp; motors erected with pipeline</td>
</tr>
<tr>
<td>January 25, 2000</td>
<td>11 kV Power charged by APSEB</td>
</tr>
<tr>
<td>January 28, 2000</td>
<td>Dry run of motor</td>
</tr>
<tr>
<td>January 30, 2000</td>
<td>Testing of pipeline</td>
</tr>
<tr>
<td>February 1, 2000</td>
<td>Trial run and commissioning</td>
</tr>
<tr>
<td>February 2, 2000</td>
<td>Water reaches Tirumala</td>
</tr>
</tbody>
</table>

Compressor room and pumphouse
Tirumala Hills, abode of Lord Balaji, attracts the largest number of pilgrims. The Balaji temple at Tirumala is the richest, supporting a large number of educational and social development projects for years. The number of visitors to Tirumala has been increasing year after year, as also their offerings.

In 1999, Tirumala faced acute shortage of water due to an extended dry spell and failure of monsoon. The main source of supply from the three reservoirs up the hills dried up. The then AP Chief Minister, Mr. Chandrababu Naidu, decided to act fast, to ensure water supply for the peak Brahmotsava season some three months away. He telephoned Mr. A Ramakrishna (AR), Deputy Managing Director and President (Operations) L&T, heading the ECC operations.

AR sent his senior colleague, Mr. K.G Hariharan (KGH) now Executive Vice President and Head Industrial Projects & Utilities Sector. This veteran builder of several projects for ECC, had a long meeting with senior bureaucrats and had just a night to prepare the estimate (even before accessing information on the terrain or topography). The brief was to pump water from the plains to the hills. When he met the CM next morning, Mr. Naidu requested for the delivery of water to the hills in two months! Knowing the urgency and the importance, KGH said he would try to complete it in three months, if Lord Balaji willed so.

**Faith can move mountains**

KGH and his team delivered the project ahead, in 77 days! Pumping 45 lakh litres of water every day over 8.5 km and a head of 763 metres through a steep gradients. Here is an account of how this was achieved, as a first person narration by KGH.
I recall vividly that auspicious day of Deepavali., when I received a call from A Ramakrishna, my boss, requesting that we meet Andhra Pradesh chief minister Chandrababu Naidu the very next day at Hyderabad. Ramakrishna went on to say that Naidu had solicited the help of L&T-ECC to resolve one of his immediate problems. I recalled with some hazy memory, about his talking about an acute water scarcity at one of the holiest of Hindu shrines of worship – Tirumala. Despite this, I was a trifle taken aback primarily because of the fact we would have to face Andhra Pradesh CM with not much of an extensive knowledge on this problem and that too at such short notice. But AR’s persuasive skills were at its best when he said: “KGH, I know you can handle the situation. Well, I have got that confidence.” He had in the past used these few words to great effect on me, thereby getting me to address some of the most challenging tasks.

**Challenges**

I reached Hyderabad next day along with my trusted lieutenants V V Subbiah and S Jagannathan. At 7 pm the same night we had a meeting with some of the senior-most state secretaries headed by Rambabu, additional chief secretary in the Andhra Pradesh secretariat. The goal was to transport water from Tirupati – the foothills of the holy shrine to Tirumala, the abode of the Lord. Simplistic as they made it sound, my experience gave me a ringside view of the challenges that needed to be surmounted to accomplish this daunting task. The project involved the transportation of water over a height of around 800 metres, construction of ground level service reservoirs, electrical substation, piping mains and accessories. It also called for design, supply, installation, testing and commissioning of the pipeline, erection of pumps with motors and surge protection equipment – overall a comprehensive engineering, procurement and construction (EPC) project.

The secretaries expressed their desire to have the estimate on the project cost within 24 hours – a stiff and imposing deadline considering the fact that we did not have the complete technical data that the project would demand. That was the first of many challenges.

Midnight oil was burnt, people harnessed at short notice and at unearthly hours, minds applied, knowledge recalled and pooled and we were ready to face this preliminary challenge. That same night we had a meeting with the chief minister wherein he expressed his immense confidence in L&T’s ability to meet deadlines and bring the task at hand to fruition. However, what he expected was a trifle too impossible – completion of the project in 60 days! With a little deliberation I agreed to complete this job in 90 days.

**Several reputations at stake...**

Today, on hindsight, I do not know what force made me offer this impossible deadline. In the past, my excellent support system in the form of my dedicated colleagues, workers and well-wishers had ensured that I never failed in executing a project. However, in this case, past successes were overshadowed by an element of doubt: was I taking on too big a challenge? Was I being over-confident about my abilities? Although, there was no fear of failure, the stakes in this project were too high. Not only was I staking my own reputation but that of several individuals and entities. Failure would not just taint me but affect A Ramakrishna and L&T-ECC as a whole. A leader like Chandrababu Naidu, who had, by awarding the job to L&T-ECC, reposed great faith in our abilities, would also get tainted since he had not called for an open tender to save on the time that would be lost in a tendering process. The failure would be as public and as memorable as any possible success.

“Abu, rush to Madras”

One of the foremost requirements of this project was an able and battle-hardened workforce.
who would not stop at anything to ensure successful completion. My thoughts went to one Aboobuker, who had worked with me 11 years back and was with me for over a decade. A trusted and dedicated worker, his involvement was an imperative to face the challenges of this seemingly insurmountable task, sent a telegram to his native place in Kerala, which read: “Abu, I do not know whether you are dead or alive. If you are alive, reach Madras the day after tomorrow and meet me.” My colleague Subbiah raised a question: “Sir, how do you know his present whereabouts?” My answer to that was, “if Abu comes to Madras, I will believe that the Almighty has blessed me and ordained that this task be completed.” I looked upon this as a test, which would provide me an indication of things to come. To my great surprise and relief, I saw Abu standing at my office the day I landed back in Chennai. The moment I got out of my car he just bent and touched my feet asking, “Sir, what can I do for you?” The answer was in my unshed tears. I saw my Hanuman who would leap across the seas and help me in our efforts. The Almighty had shown me the way. Now there was no way that the project couldn’t proceed further. I told Abu, “go back home and collect 150 workers and reach Tirupati in three days.” I also gave him the name of some workers whom I had worked with many years back. Without hesitation or question Abu only said “Seri, Sir” (Yes, Sir).

Delivery of pumps

First hurdle crossed, we began the next phase of operations. Hectic consultations were held among myself and my design team. My trusted lieutenants V V Subbiah, C Raghavan and S Jagannathan – the project In-charge. Finally, we arrived at the strategy we could adopt for this project and penned down the implementation plan. Our basic requirements were four units of 640 kW pumps and motors, connected fitments in the pump house and around 2000-3000 workers to carry out civil jobs, including the entire electrification and automation job.

We came across our next stumbling block when Subbiah said that the 640 KW pumps and motors couldn’t be procured in less than 120 days. There was an implicit issue underlying this statement, which purportedly questioned my wisdom in committing a completion time of 90 days for this project. My answer was: “a decision had been taken and you have only one option – to fall in line.” I should be thankful for the intelligence and obedience of Subbiah who immediately banished all negative thoughts and started to look at this project in a more positive sense. I called my secretary R Rangarajan and told him: “you will not move out of your seat. I will be giving you some hundred phone numbers, and it is on you to get me these people on the line at the earliest.” The first call of mine was to a very senior executive of Kirloskar Pumps & Motors. Without much ado,
I laid forward my demands. The conversation went along the following lines:

**Motors—the long and short**

“‘I need 4 x 640 kW pumps and motors. How fast can you deliver these to me?’ The answer was ‘minimum six months.’ ‘I am talking about six days, you are talking about six months’”. You keep expressing your love and admiration whenever we interact. However, when I genuinely need your help you are not with me. If you really mean what you say and love me, I want these pumps to reach us in the shortest time.”

His answer was “I can, perhaps, give it in four months.” Then I again took recourse to the Almighty and said, “this is for Tirupati.” The name of the divine helped and pat came the answer; “I will make it in 60 days.” Emboldened that it was possible, I kept on pushing, “45 days is acceptable.” In the history of this industry such heavy duty pumps had never been supplied in less than six months. Again, I would attribute this only to an unseen force, which made this possible. This incident pushed my confidence level one notch higher.

**Opportunity to wash your sins!**

We moved on to the next problem that needed to be tackled at the start: procurement of steel. We required 450 tonnes of steel plates of a particular width, which no steel manufacturer in India rolled. Again, I sought the help of another good friend — a senior executive of a renowned steel plant. Again, invoking the name of the Almighty I called up my good friend and I said: “I need these plates. ‘The answer was “Hariharan saab, we do not roll steel plates of this width.”

I shot back: “do not tell me what width you roll. I know that perfectly, since I was the one who built this plant for you.” He said: “Sorry.” I retorted: “I do not want your sorry. I want your answer. I want these plates and that too in 3 days.” My colleagues sitting in front of me looked flabbergasted that I was speaking to a senior executive in such an irreverent manner. I continued: “I will send a team of people. You start rolling plates of 1.5 m width, I will arrange laser cutting to the width of 1.25 m. I know you will incur a loss of more than 20 per cent, but remember you are doing this for Lord Balaji.”

I continued in a humorous vein: “In doing so, you would have washed your sins to a certain extent. Don’t you think it is a good opportunity that you should avail?” From the
other end I heard a good laugh and finally the answer I was pushing for came through: “I will do it saab.”

The hand of the Almighty!

His “Yes” solved only a part of the problem. The bigger problem still remained. We still needed around 450 tons of steel, which no other major steel companies were willing to provide. Here is where I again saw the hand of Almighty. We came across a company, which hitherto was never known to make steel in the plate form. They were into the manufacture of lamps. Surprisingly, this company agreed to manufacture and transport the steel that we required all the way from Delhi to remote Madurantakam in Tamil Nadu in just three days.

Problem number four stared at us in the face now. We had to find someone to roll these steel plates into pipes, each about 12m in length and all this in just three days. Divine intervention was again seen when the only spiral building company in the South, PSL Holdings, readily came forward to execute this task. During the normal course, manufacture, of these pipes would have taken close to 30 days but PSL agreed to execute this order in just three days.’ The pipes also reached Tirupati, a distance of 250 km from Chennai within a week.

Having ensured that the major requirements of the project were secured, we decided to get down to the brass tacks of implementing the plan. At this point in time I just decided to submit myself to the power of the Lord to help me finish this project within the stipulated time of 90 days.

77 day target

I had visited Tirupati exactly 24 years back when my elder daughter was hardly a year old. Since then I did not have the opportunity to have a darshan of Lord Balaji. I requested Subba Rao, executive officer of Devasthanam to arrange for my ‘darshan of the Almighty’ and also had a special request to give me some extended time before the Lord. One usually gets only a few minutes. It is to my good fortune that I could spend a couple of hours in front of the Lord and had a great darshan. My only prayers were: “Oh Lord! You never failed me in all these years, don’t fail me at your doorsteps.” My tears were my “pujapushp” at his feet. When I came out after the darshan, I called my boys and set a few target dates wherein we were required to complete some milestone activities. I termed this project a “77 day wonder” – that was the internal target we set for ourselves.

One other challenge we faced was the question of transporting
this scale of operations was still something that I faced for the first time. The transport of material for concreting proved a Herculean task. We formed a human chain and also used donkeys to transport the same up the treacherous terrain. By God’s grace and due to careful monitoring and precision management of activities we were able to achieve the target dates for the milestone events accident-free.

Apart from the technical aspects, what would eventually ensure the success of this project was the enthusiasm level of the people involved in it. A project so demanding would eventually take a toll on the people. Motivation was hence the need of the labour. To demonstrate that the top management was equally involved in the success of the project and also to show that the gargantuan accomplishments of the workers on the ground was not going unnoticed, we got our chief A Ramakrishna visit the project site and interact with the workers. It is to the credit of Ramakrishna that amidst his tight schedule and various constraints, he decided to walk down the rugged hills. During the course of the walk met all the workers and staff. This was a great morale booster for all concerned.

The other incident connected with the project, which stands out in my memory, is the oath taken by Abu and his predominantly Muslim labour force to stay off liquor, smoking and non-vegetarian food for the entire duration of the work. This best exemplifies the grassroot belief in secularism.

The ‘D-day’ arrived for testing and commissioning of the pipeline. The pressure to be tested was 95 kg / cm². Even though I had been touring extensively, I was in touch with Jagannathan, my trusted lieutenant, practically on an hourly basis. On the designated day, soon after my morning prayers I called Jagannathan and enquired about the pressure. His answer was “which pressure are you asking about Sir, mine or line pressure?” In a choked and shivering voice he said the golden words, which we were all waiting to hear – “water has reached Tirumala.” The tears that I shed on hearing this were tears of joy and relief. This was truly one Jagannathan rendering yeoman service to another Jagannathan – the Almighty Lord himself. The other person without whom this project would never have attained completion is Raghavan. Again a dedicated, selfless and hardworking individual who gave his all to realise this impossible dream. Again one Raghavan in the service of another Raghavan – the Almighty Lord himself.

‘It’s not me who did it’

I am very sure if anyone asks me to repeat this type of a job, I will never be able to do this again. It is not me who did it.

This was a project where passion worked for reasons that went far beyond money and status. A propensity to pursue goals with energy and persistence to hallmark. A strong drive to achieve optimism, even in the face of failure is not a project executed by men, it was a Divine Project executed by men through His guidance and blessings.
Water Infrastructure - AP Style

Panchayat Raj Department and the Public Health and Municipal Engineering Department of Government of Andhra Pradesh are implementing various water supply schemes and improvement schemes to provide potable drinking water to millions of people in different parts of the State.

ECC has gained the confidence of these departments after the successful commissioning of Sri Sathya Sai Water Supply Project and Tirumala Water Supply Projects. This is reflected in ECC securing some contracts in Andhra Pradesh which are described below.

Narasampet Water Supply Project

This project provides comprehensive protected water supply for Domakonda and other 18 neighbouring villages in Nizamabad District.

Scope of ECC’s work included construction of rapid sand filters, clear water sump, OHBR and DI pumping main for Narasampet Water Supply Project in Warangal District and construction of 4 MLD sewage treatment plant (STP) at Reddy Colony and 2.5 MLD STP at Godavari pally near Mancherial, Karimnagar District.

Project Highlights

- Design, construction, testing and commissioning of water treatment plant/rapid sand filters (1 no.) at head works of 15.74 MLD.
- Construction of two 8.50 lakh litre capacity clear water sumps with vibrated reinforcement cement concrete.
- Construction of 2.00 lakh litre capacity overhead balancing reservoir (1 no.) using vibrated reinforcement concrete.
- Supply, trench excavation, laying, testing and commissioning of 500mm dia DI pipeline of 2 km along with specials, valves and RCC valve chambers for water supply.
- Construction of 4 MLD and 2.5 MLD sewage treatment plants.

The works commenced in February 2002 and was completed in 18 months.

CPWS Scheme – Domakonda

This scheme meets the drinking water needs of Domakonda and surrounding villages in Nizamabad District.
The scope of work included construction of infiltration well cum pump house, slow sand filters, clear water sumps, overhead balancing reservoirs and supply, laying, testing and commissioning of CI, DI, HDPE and PVC pipelines.

The quantum of work involved 17.10 km of DI K9 pipeline (dia 200 to 350 mm), 3.42 km of CI pipeline (dia 250 to 500 mm), 23.20 km of HDPE pipeline (dia 110 to 250 mm), one infiltration well cum pump house of 10 m dia, one foot path bridge of 120 m long and 2 m wide, 1890 sq.m of slow sand filters (3 nos. – 35 m x 18 m), one clear water sump of 400 kl capacity, one clear water sump of 350 kl capacity, two pump houses of size 6 m X 4 m, two security quarter of size 6 m x 4 m and two overhead balancing reservoir (40,000 litre capacity and 25 m staging).

ECC executed the project within the stipulated time of 12 months.

**CPWS Scheme - Kangti**

Kangti is an acute drought prone area with high fluoride level content in ground water. This project was implemented with assistance from NABARD.

**Project Highlights**

- Construction of Intake well cum Pump House including Intake chamber in Manjeera River Bank.
- Construction of 4.00 MLD Water Treatment Plant with rapid sand filters on hillock area.
- Construction of 26 overhead service reservoirs.
- Construction of sumps and pump houses.
- Construction of CI, DI pumping and gravity main pipelines.
- Construction of HDPE gravity pipelines.

ECC’s scope of work included construction of treatment plant, intake well, service reservoirs, sumps, pump houses and construction of various pipelines. The quantum of work involved construction of 13.54 km DI k9 pipe line (dia 250mm), 26.23 km CI pipe line (dia 80 to 300mm), 113.32 km HDPE pipe line (dia 63 to 315mm), one raw water collection well cum pump house, design and construction of a 4.00 MLD rapid sand filters, 26 overhead service reservoirs (40,000 litre capacity - 24 nos and 60,000 litre capacity - 2 nos), 11 ground level reservoirs (20,000 litre capacity - 3 nos and 10,000 litre capacity - 8 nos), one overhead balancing reservoir (40,000 litre capacity), two ground level balancing reservoirs (2,50,000 litre capacity - 1 no and 20,000 litre capacity - 1 no), five clear water sumps (550kl-1 no., 130kl – 1 no., 70kl – 1 no. and 40 kl-2 nos.)

This 18 month contract was executed 3 months ahead of schedule.

**Water Supply Improvement Scheme**

This project provides drinking water to people of Itchapuram, Salur and Amadalavalasa, near Vijayanagaram, Andhra Pradesh.

The scope of work covered supply, laying, testing and commissioning of DI K9 pumping mains of size 150 to 300 mm dia on turnkey basis including all associated civil, valves and fitting works. The quantum of work involves 4924 RM of 150 mm dia DI K9 pipes, 5365 RM of 200 mm dia DI K9 pipes, 620 RM of 250 mm dia DI K9 pipes and 4904 RM of 300 mm dia DI K9 pipes.

**Project Highlights**

- Manufacture, supply and delivery of 200 mm dia DI pipes of K9 class with cement lining, DI fittings, sluice valves, air valves etc., - laying, jointing and testing of pipeline including excavation, refilling after testing the line including all appurtenant works; construction of valve pits, fixing covers etc., for pumping mains at Itchapuram.
- Providing 200 mm dia DI pipes of K9 class pumping main from headworks to proposed 800 kl...
ELSR at Oriyapandaveedhi including supply of DI pipes, specials, valves and also appurtenant works like earth work, laying and jointing, fixing of valves, refilling, testing including construction of masonry valve pits at Salur.

- Manufacture, supply and delivery of 300 mm dia DI pipes of K9 class with cement lining, DI fittings, sluice valves, kinetic air valves etc., laying, jointing and testing of pipe line including earth work excavation, refilling including all appurtenant works – construction of valve pits, fixing covers etc., for pumping mains at Amadalavalasa.
The work was completed in 12 months.

**Summer Storage Tank, Chilakaluripet, Stage II**

This consisted of construction of 2690 million litre capacity summer storage tank including maintenance period of 2 years at Pothavaram near Chilakaluripet, A.P.

The scope included earthwork excavation for cut-off trenches, formation of hearting zone (core portion) including compaction, providing inclined and horizontal sand filters, stone revetment, rock toe, chute drains, providing turfing and miscellaneous piping works.

The quantum of work involved 358660 cu.m of excavation and forming bunds, 33376 cu.m of sand filters, 11811 cu.m of metal filters, 23952 cu.m of revetment and rock toe.

The contract was completed in 12 months.

**Summer Storage Tank, Ponnur, Stage - I**

This consisted of construction of 1760 million litre capacity summer storage tank at Ponnur, Guntur District, including maintenance for 2 years.

The scope involved earthwork excavation for cut-off trenches, formation of hearting zone (core portion) including compaction, providing inclined and horizontal sand filters, stone revetment, rock toe, chute drains, providing turfing and miscellaneous piping works.

The quantum of work involved 346805 cu.m of excavation, 13904 cu.m of revetment and rock toe, 38266 cu.m of sand filters, 8286 cu.m of metal filters and 80730 cu.m of casing covers with cohesive non swelling soils.

**OHSR at Ananthapur**

The Rural Development Trust of Ananthapur awarded this contract to ECC for designing and constructing the Overhead Service Reservoirs (OHSR) at nine locations in Ananthapur District.

This 12 month contract was completed 2 months ahead of schedule. This was the first job awarded to ECC by Rural Development Trust, a non-profitable organisation working in Anantapur district. Initially the Trust gave an order for construction of five OHSRs followed by another for four OHSRs.

Y. S. Srikanth  
Construction Manager
Visakhapatnam, the second largest city in Andhra Pradesh is strategically located on the East Coast of India and it is an important industrial port town. Since several mega-infrastructure projects have come up in and around Vizag, like the Special Economic Zone (SEZ), the Pharmacity at Paravada, a Greenfield multi-purpose deepwater port at Gangavaram, etc. Vizag has become a potential growth center for major industries.

The city of 13-lakh population requires 56 million gallons per day (MGD) of water for both domestic, as well as industrial purposes. The installed capacity of all the available sources supplying water to Visakhapatnam City till recently was just 37 MGD leaving a deficit of 19 MGD and moreover, all the sources supplying water to Visakhapatnam are rainfed.

Therefore, the Vizag Municipal Corporation (VMC) explored alternative sources to overcome the crisis and came to the conclusion that the diversion of Godavari waters was the only solution to present problem. The state government sensing the critical need of a reliable source of water supply to cater to the needs of domestic and industrial consumers directed the Andhra Pradesh Industrial Infrastructure Corporation (APIIC) to implement the Visakhapatnam Industrial Water Supply Project on a commercial format.

A reliable source of water is a major requirement for this mega infrastructure development and Vizag Industrial Water Supply Project (VIWSP) was conceived to meet this demand. And, this is the first of its kind Water Supply Project in the State of Andhra Pradesh, implemented through the Public – Private Partnership route.

A Special purpose vehicle in the name of Vizag Industrial Water Supply Company (VIWSCO) has been formed for executing this project. L&T - IDPL and PSL Ltd. holds 51 per cent equity in this project while the APIIC and VMC jointly hold.
the rest of 49 per cent stake. VIWSCO is entrusted with the design, construct, operate and maintain the project on a Build Own Operate and Transfer (BOOT) basis.

According to the contract, L&T supplies Godavari water through the Yeleru canal to meet the requirements of the Visakhapatnam Steel Plant, NTPC and other industries and also meet the drinking water needs of the Vizag city.

This involved augmentation of water supply to Yeluru Left Bank Canal (YLBC) from Godavari at Rajamundry, for which a 2600 mm dia MS pipeline was laid for a distance of 56 km. This also involved construction of a 22m dia intake well and pump house with a 400m connecting bridge at Godavari river including all associated electromechanical works and supervisory control and data acquisition (SCADA),

The first phase of this Project was completed in a record time of 12 months and the commercial operation was inaugurated on September 26, 2004. The project supplying 520 million litres per day (MLD) of bulk water to different industrial units in Visakhapatnam-Kakinada corridor.
Water Supply Projects in Karnataka

The city of Bangalore, founded by Kempegowda in 1537, is situated on a plateau with an altitude ranging from 2,700 ft. to 3,100 ft. above sea level. It depended for its water supply for a long time on a chain of tanks and ‘Kalyanis’ constructed by philanthropists. The first major and dependable source created to meet the increasing need of water was the Hessarghatta Reservoir across river Arkavathi about 11 miles north of the city. This was commissioned in 1896.

In 1933, a second and much larger source was created by the construction of a second reservoir, also across river Arkavathi, about 38.4 km downstream of the first reservoir, near Thippagondanahalli – 25.6 km west of the city. Both the reservoirs put together supplied 32 to 34 million gallons per day of water to the City. Over the years, the situation has been steadily deteriorating with the influx of more people and industries into the city.

**Cauvery Water Supply Schemes**

It was against this background that the Bangalore Water Supply and Sewerage Board was constituted in 1964. The most important project undertaken by the Board - Cauvery Water Supply Scheme (CWSS) was to bring the perennial water of river Cauvery to quench the thirst of Bangaloreans. The first part of the scheme involved the production and conveyance of 30 million gallons per day of filtered water to Bangalore.

The Cauvery project involved the drawing of water from the Netkal Balancing Reservoir and conveying it to the city over a distance of 95 km. A 1800 mm diameter pipeline draws water from this intake and conducts it by gravity over a distance of about 9.6 km to Thorakadanahalli (T.K. Halli) where the purification plant is located. Filtered water is then pumped from T.K. Halli to Bangalore through a transmission main against a gross head of 450 m – negotiated by three-stage pumping, each against 150 m head. Water received at the south end of the city is distributed to a number of main and subsidiary reservoirs for being fed to the distribution system.

**CWSS Phase - I**

The Cauvery Water Supply Scheme (Phase I) was executed by ECC during 1970-75. ECC was selected through an international competitive bidding in 1969 and was awarded the work of laying the gravity main and transmission main lines in August 1970. This involved pumping 135 million litres of water over a head of 150 m between Netkal Reservoir and South End circle, against the force of gravitation.

ECC’s scope of work involved fabricating pipes out of steel plates (supplied by the Board) and laying them. The total steel involved in the fabrication was 33,000 tonnes. ECC had set up two giant fabrication complexes – one at T.K. Halli, (83.2 km from Bangalore) and the other at Jakkasandra (40 km from Bangalore).

The mild steel plates, fully imported, came in sizes of 2500 mm x 4000 mm x 12 mm or 10 mm for transmission main and 2500 mm x 5700 mm x 12 mm for the gravity main. The plates were cut to the
required size by oxy-acetylene straight line cutting machine. They were then bent into shells of 2.5 metres length in the Bending Rolls. Three such shells were assembled to make one pipe. The longitudinal and circumferential joints were welded by automatic submerged arc process.

The pipes were lined, gunnited and cured. They were lifted by means of cranes from the curing tanks and loaded into articulated trailers and hauled by 15-tonne capacity diesel driven prime movers to the laying sites. The pipes were unloaded adjacent to the pipe trenches by means of cranes and lowered and aligned in the trenches by means of tripods and their pulley blocks. They were then manually welded and tested hydraulically to twice the working pressure in lengths of about one kilometre.

For most of its length, the pipeline was laid in specially dug trenches and covered with earth to protect it from damage and thermal stresses. ECC had to build five bridges to negotiate the pipeline over river valleys. ECC completed the phase I project to the entire satisfaction of BWSSB.

**CWSS, Stage IV, Phase I**

The scheme comprises of abstraction, treatment and transmission works which run parallel with the existing stage I, II and III schemes. The major components of works in the scheme construction of:

a) Raw Water intake and transfer from Shiva Anicut to T.K.Halli works

b) Water Treatment plant of 270 MLD at T.K.Halli and

c) Transfer of treated water to city reservoirs in three stage pumping system.

Pacific Consultants International (Japan), Molt Macdonald (UK) and TCE (India) were the Consultants for the project.

ECC subsequently executed 2 packages under Stage IV ie., contract W3a and W5b.

**Clear Water Reservoirs and Pumping Stations**

This involved construction of clear water reservoirs, pumping stations and other associated works at T.K.Halli, Harohalli and Tataguni. These reservoirs are located approximately 83 km 40 km and 19 km respectively from Bangalore. The scope of works under this contract included construction of:

a) 24 MLD capacity reservoir and pumping station at T.K. Halli

b) 12 MLD capacity reservoir and pumping station at Harohalli and

c) 12 MLD Capacity reservoir and pumping station at Tataguni.

In addition, this involved miscellaneous civil works for site development, switch yard, compound walls, site grading, fencing, road works, pavements etc., in all these three locations.

---

*Surface aeration tanks at the 75 MLD sewage treatment plant in Bangalore*
The critical water receiving structures and other structures were executed under strict supervision / inspection by Board Engineers and Consultants.

Valued at Rs.2126 lakh, this work involved major quantities like excavation – 150765 cu.m, concreting – 30924 cu.m, shuttering – 76859 cu.m and reinforcement of 2698 tons. Work commenced in December, 1998 and was completed by June 2002.

Balancing reservoirs

This contract involved construction of balancing reservoirs at Kothnurerdine, Kodichikkanahalli and Hoody with capacities of 36 MLD, 18 MLD and 10 MLD respectively. Apart from civil works for the above reservoirs, the scope of work also included supply and erection of sluice gates, valves, chlorination system and electrical / instrumentation works. All these places are located within 20 km distance from Bangalore City.

Valued at Rs.1300 lakh, the work involved major quantities like excavation 66963 cu.m, concreting-15075 cu.m shuttering – 39605 sq.m and reinforcement of 1460 tons.

Taken up in May 1999, the work was completed in two years’ time.

Karnataka Urban Water Supply & Drainage Board

Karnataka Urban Water Supply & Drainage Board (KUWSDB) came into existence on 14-8-1978. This takes care of execution of all water supply and drainage works in urban areas in Karnataka except Bangalore City and 8 Municipalities in and around Bangalore. The work executed by KUWSDB encompasses providing piped water supply schemes to towns, accelerated urban water supply schemes including underground drainage scheme.

KUWSDB has been making significant contribution to the people of Karnataka through implementation of such schemes. Some of the projects executed by ECC for KUWSDB are described below.

Underground drainage works at Tumkur

ECC carried out the underground drainage works at Tumkur for KUWSDB which were funded by Asian Development Bank.

Tumkur town is situated at about 70 km northwest of Bangalore on NH 4. The above scheme was implemented in two phases with the first phase designed to meet the demand requirement upto 2006, together with provisions for future expansions. The second phase would meet the requirement projected for the year 2021. For the purpose of sewage collection system the town was divided into 16 drainage districts.

The package entrusted to ECC included sewage system in District 10
and construction of the entire outfall sewers. The scope of work comprises supply and laying of salt glazed stone ware pipes, RCC pipes, CI pipes and construction of manholes.

The project involved deep excavation on narrow roads and blasting works in the heart of the city and also in several residential areas for rock excavation. ECC was the only agency in Tumkur to successfully complete the package with high degree of safety and quality and with least inconvenience to the public.

The quantum of work involved 1,21,000 cu.m of excavation, laying of 33,000 m stone ware pipes, 6800 m RCC pipes and construction of 1400 manholes.

Commencing the works in July 1999, ECC completed the project in July 2001 as per the schedule.

Water Supply & Underground Drainage System to Ramanagaram Town

Ramanagaram town is situated at about 55 km from Bangalore enroute Mysore and had no sewers. Funded by Asian Development Bank, this project was implemented by KUWSDB in a phased manner for supplying piped water to Ramanagaram and Channapatna towns from river Cauvery and providing underground drainage system to Ramanagaram town.

The water supply scheme was implemented in two phases, with the first phase designed to supply 15 MLD to meet the demand requirement upto 2006, with provisions for future expansions. The second phase would meet the ultimate requirement of 26 MLD including the underground drainage scheme designed for 2021 population.

The work entrusted to ECC comprised water supply network for Ramanagaram town using PVC / CI pipes and the underground drainage work using Stoneware pipes / RCC pipes and construction of manholes.

ECC successfully completed the water network and the first phase of underground drainage works inspite of hazardous conditions like deep excavation on narrow roads and thickly populated areas. However, ECC took necessary care to ensure safe working environment for its workmen and the general public. On seeing the good quality of workmanship and speedier completion of projects, KUWSDB awarded additional contracts for the execution of underground drainage works.
This contract involved major quantities like 1,35,000 cu.m of excavation, laying 41500 m of stoneware pipes, 2500 m of RCC pipes, 58,000 m of PVC pipes, 17200m of CI pipes and construction of 1730 manholes.

**Pumping Stations and 7.56 MLD Sewage Treatment Plant at Ramanagaram**

ECC constructed four sewage pumping stations including a 7.56 MLD Sewage Treatment Plant at Ramanagaram for KUWSDB, funded by Asian Development Bank. The present STP has been designed for a population of 70,000 by 2011.

This project comprised construction of 4 wet wells, CI rising main of 7500m and a 7.56 MLD Sewage Treatment Plant (STP) including erection of pumps, motors and other allied electro-mechanical services.

**Augmented Water Supply Scheme for Chickmaglur**

KUWSDB implemented a scheme for augmentation of water supply to Chickmaglur with a loan from the Housing & Urban Development Corporation Limited (HUDCO). The work was executed by ECC in eighteen months as stipulated in the contract.

Chickmaglur is located about 250 km from Bangalore enroute to Shimoga. The population of the town is expected to touch 176,000 by 2021.

The scheme was designed to meet the ultimate demand of 2021 at 23.5 MLD. This involved construction of a Water Treatment Plant (WTP) at about 15 km from jackwell source, raw water rising main, pure water rising main, pure water sump, raw water and pure water pumpsets, overhead tanks, ground level storage reservoirs, pump house and distribution network including all electro-mechanical services.

This contract involved laying 600 mm dia PSC pipeline to a length of 20525 m, 600 mm dia MS pipeline – 11035 m, 300 mm dia CI pipeline – 3600 m, one 10 lakh litre capacity overhead tank, three 5 lakh litre capacity overhead tanks and one 5 lakh gallon ground level storage reservoir.

**Unaccounted for Water, Bangalore**

Bangalore, a Cosmopolitan City, is spread across 366 sq.km with a population of nearly 6.5 millions. To meet the city’s ever-growing water needs Bangalore Water Supply and Sewage Board (BWSSB) has taken up many schemes for implementation. One of them is the pioneering UFW scheme – Unaccounted-for Water -

43 m dia clarifloculators at 73.8 MLD water treatment plant for Hubli-Dharwad Water Supply Project
and Larsen & Toubro was entrusted with its execution. Thames Water, London was L&T’s partner in this project.

This Pilot Project comprised around 35,000 service connections which were split into 22 District Meter Areas (DMA). The design of DMA was done with the aid of computer network models. The inflow and outflow are monitored continuously to determine the leakage level. Latest scientific equipments have been used to detect and plug leakages.

The implementation of UFW project has helped BWSSB save Rs.330 lakh per annum and enhance water supply in terms of both quantity and quality, conserving 13.89 MLD of water. The overall pressure at the distribution ends has been improved to ensure uninterrupted supply and consumer satisfaction.

**Hubli-Dharwad**

The twin cities of Hubli and Dharwad are considered the second largest city of Karnataka with a population of over 8.5 lakh. Hubli has many industries while Dharwad is a center for education and culture. The Neersagar and Malaprabha reservoirs, operated and administered by the Karnataka Urban Water Supply and Drainage Board (KUWSDB), are the primary sources of water supply for Hubli-Dharwad.

To supplement the recent water supply augmentation efforts, KUWSDB decided to replace the existing feeder lines with new MS lines. As the successful bidder, L&T executed the work of laying 762mm dia (OD) pipes from Neersagar for a distance of 4 km and 965mm dia (OD) pipes from Malaprabha covering a distance of 30 km between Soundatti and Amminbhavi. Under its scope L&T also constructed rectangular open type jackwell at Soundatti to meet the projected demand by the year 2031.

The Company also designed and executed a 73.8 MLD (in 22 hours) Water Treatment Plant at Amminbhavi on turnkey basis and built elevated storage reservoirs at 5 Locations, taking into account the prospective expansion of the city.

The primary purified effluent is aerated with the surface aerators at the secondary cleansing. Subsequent to this two-level processing, the
Regional Water Supply Scheme, Maddur

ECC was awarded a contract for the complete package of supplying 17MLD Drinking water to Maddur in the year April 2001. Maddur is located 90 kms from Bangalore. This town has population of approx 1,00,000 including 39 villages enroute.

Though there were several hurdles ECC’s project execution team went on with top priority and completed the project ahead of time.

In recognition of the strenuous efforts and appreciation for the high quality work rendered by ECC, the Honourable CM personally thanked all concerned and presented a memento to Mr. S. Jagannathan, Sector Projects Manager, Bangalore in a public function on December 15, 2003.

Highlights

- M.S. Pipeline 508 mm/406 mm dia with internal Lining & gunniting (supplying & laying) - 75 kms
- 17 MLD Water Treatment Plant (with 4 nos. of Filter Beds) - 1 Unit
- Intermediate Pumping Station with 150 HP, 30 HP Pumping Machinery -3 Unit
- Jackwell with 225 HP Pumping Machinery- 1 Unit
- DI / PVC / CI pipeline - 30 kms

Effluents turn into sludge. The denser sludge is collected at the bottom by gravity and the balance is thickened at the sludge thickener.

Then these effluents undergo the treatment again in a tertiary treatment plant and become suitable for irrigation, industrial activities and recreational activities (gardening, water sports, fountains, etc.). Presently the project is under construction and is expected to be completed in 2006.

S. Jagannathan
Sector Projects Manager (IP&U), BLRO

Overhead water storage reservoir for Hubli-Dharwad Water Supply Project
Godavari Drinking Water Supply Project
Yet another saga from Bhagwan Sri Sathya Sai Baba

The upland and backward areas of East & West Godavari Districts, which are mainly inhabited by tribals and economically weaker sections of people, depend mostly on borewells and river streams for their drinking water needs. Even though these people live by the side of Godavari, they are deprived of potable water. Moreover, the borewell water contains rich iron content and the stream/river water is unsafe for drinking due to its high bacterial content. Due to excessive exploitation of ground water, the borewell also dry up in summer months, making people trudge long distances for carrying water.

Thus, Sri Sathya Sai Central Trust under the benign guidance of Bhagavan Sri Sathya Sai Baba, decided to provide pure drinking water from assured sources of Godavari river and its tributaries to the water starved people in East and West Godavari Districts.

East Godavari District

For this purpose, two main sources were selected for supplying the raw water. One is river Godavari and the second ‘Pamuleru’, a tributary of Godavari, both of which flows throughout the year. Accordingly, this caters to about 220 habitations covering a population of about 2.30 lakhs, with provision for expansion for another 1.00 lakh population.

Two schemes

In the East Godavari District two schemes are under implementation.

Scheme – I

Under Scheme-1, ECC is constructing a 6m dia 25m high intake well at Purushottampatnam on the bank of river Godavari and it is installed with vertical turbine pumps, which supplies raw water through 400 mm dia pipeline to the treatment plant at Purushottampatnam located at a distance of 0.5 km.

This 10.5 MLD treatment plant employs rapid sand filtration method for purification. From here the clear water is pumped to a GLBR of 10.00 lakh litre capacity situated on the top of a hill, from where the water will be supplied to the villages, by gravity. Sumps, OHSRs and GLSRs will be provided in between for storage and distribution. Intermediate pumping is also provided wherever ‘peaks’ are to be crossed, as the line passes across hills and forests. This project will provide drinking water to about 70 villages initially with scope
to cover another 20 villages catering to a total population of 2.5 Lakhs.

**Scheme-II**

In the second scheme an intake well is being constructed across river ‘Pamuleru’, a tributary of River Godavari, from where raw water will be pumped to the treatment plant situated at Kuttravada, located at a distance of 1.4 Km.

Here again the 3.5 MLD capacity treatment plant employs rapid sand filtration method and after treatment, the water will be supplied to about 150 villages.

Various pipes like AC, HDPE, PVC, GRP, MS etc., are used in the project totaling a length of 405 Km. On the occasion of Swamy’s 80th birthday on 23.11.2005, trial run and commissioning took place and pure drinking water is already supplied on tap to few villages.

**West Godavari District**

Sri Sathya Sai Water Supply project in the West Godavari District caters to 220 habitations covering a population of about 4.7 lakhs.

In this district, the source for the intake well is located at Polavaram village on the bank of river Godavari. Here an intake well of 6m dia and 28m high is built with vertical turbine pumps. The raw water from Polavaram is pumped to the ‘Hukumpeta’ water treatment plant located at a distance of 7.5km.

<table>
<thead>
<tr>
<th>Highlights</th>
<th>East Godavari</th>
<th>West Godavari</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population Covered</td>
<td>3.3 lakhs</td>
<td>4.5 lakhs</td>
</tr>
<tr>
<td>Villages covered</td>
<td>220 nos</td>
<td>230 nos</td>
</tr>
<tr>
<td>No. of Intake wells</td>
<td>Two</td>
<td>One</td>
</tr>
<tr>
<td>No. of treatment plants</td>
<td>Two (3.5 &amp; 10.5 MLD cap)</td>
<td>Two (21.75 &amp; 1.00 MLD cap)</td>
</tr>
<tr>
<td>Length of pipelines</td>
<td>493 km</td>
<td>423 km</td>
</tr>
</tbody>
</table>

The Hukumpeta water treatment plant has a capacity of 21.75 MLD and it also employs rapid sand filtration method for purification. The purified water is pumped to a GLSR situated on a hillock nearby and from here water is distributed to various villages. Intermediate pumping is also done wherever required.

Various piping materials like GRP, MS, DI, AC, HDPE and PVC are used for transmission of water and the total length of pipeline will be around 430 km.

The entire work is expected to be completed by March 2006.

K. Masilamani
RPM (Water & Utilities), HYRO
Water Supply Projects in Tamil Nadu

Water supply and sewerage management in Tamil Nadu are overseen by two Government organisations, namely:

- Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) - responsible for water supply and sewerage management in the metropolitan area of Chennai.
- Tamil Nadu Water Supply and Drainage Board (TWAD) - responsible for water supply and drainage works in the rest of Tamil Nadu including corporations, municipalities and other local bodies.

Water supply and effluent treatment came to acquire importance and received the attention of Central/State Governments over a decade ago and L&T has ever since been playing an active role in this vital sector. In Tamil Nadu, L&T made a beginning in this area with the Ramanathapuram Water Supply Project in 1997 and continues to have a major presence.

L&T’s Contribution to Chennai

The first project that L&T bagged in Chennai was the “Second Chennai Water Supply Project”, funded by the World Bank. The project consisted of five packages and envisaged laying of pipelines for distribution to different parts of Chennai. The pipelines aggregated to a running length of 600 km of ductile iron pipes ranging from 100mm to 1000 mm in diameter.

L&T executed another project of “leak detection and repair works”, which again was aided by the World Bank. The project was a new concept taken up for implementation in a few Metropolitan cities and Chennai was the first to implement this. Studies conducted as part of the project revealed that almost 40% of the water transmitted through pipelines was being lost due to leakage in the distribution mains and house service connections.

Special testing equipments and techniques were used to detect leaks...
in the pipelines laid a few decades ago. The leaks were plugged by replacing the corroded cast iron distribution mains partially or in full as required and by applying sealants or through chemical treatment, depending on the extent of leakage. The project involved testing of 1400 km of distribution mains and replacement of 500 km of existing pipelines and 1,70,000 house service connections.

Defective pipelines were replaced by new cast iron (CI) pipes as per the direction of CMWSSB after ascertaining the extent of corrosion and life of the existing pipelines. Old PVC pipes were replaced by new CI pipes. Old service connections (PVC/GI pipes) to individual houses were replaced with new MDPE pipes and imported Polypropylene (PP) fittings, which would be more durable and have a longer life span. After these replacements, leak tests were again done to ascertain that the leaks had been effectively arrested.

L&T’s role in other parts of Tamil Nadu

Most of the projects executed by L&T for TWAD Board have been in rural areas. Typically a scheme comprised of headworks of either infiltration wells in river or a collection well with radial arms inside the river. The water was pumped through pipes (prestressed concrete, asbestos cement or cast iron), depending on the design and pressure requirement, to booster stations and then to reservoirs for feeding the rural habitations. The spread of each scheme was between 50 km and 100 km, end to end.

With our credentials getting established at TWAD Board by virtue of our work executed for them, we have succeeded in forming our rapo with them. We were instrumental in selling the ideas of bunching of small packages as turnkey ones instead of small disintegrated jobs. This was implemented by TWAD and now all
the TWAD Jobs are on Turnkey Basis. We have been also consulted by TWAD board for helping them in modifying their contract terms in light of our experience with other Water Boards of other states.

Though the water supply projects does not call for very high technological innovations, but the happiness and pride one gets at the end of the day, after the scheme is commissioned and the water is given to the poor village folks, is unpriced.

Though it’s tough bargain, we L&T-ites of the WET BU consider ourselves as privileged to work for the noble cause of quenching the thirst of poor people.

All water supply projects for TWAD board are typical in nature and mainly comprises of the following components.

### Components of the Project

#### Head Works

Water is drawn from the river by constructing intake wells inside the river and water is guided through the pipes to the bank of river with the help of pumping. These pumping mains laid for drawing water from the intake well are nomenclatured as short rising mains.

Water so pumped in these mains are collected on the bank in the RCC sump.

Sometimes depending upon the treatment requirement and the condition of sand inside the river, infiltration wells are sunk deep inside the river bed and then filtered water is drawn and directly pumped, other wise raw water is pumped to the bank of the river and treated on the bank in a water treatment plant facility.

#### Sumps and Pump Houses

RCC sumps and pump houses are constructed for collecting the water and pumping it to the required habitations. Depending upon the length of the scheme, booster pumping station requirements are decided. Each pump house is provided with the required duty condition of the pumping machinery to pump the water further.

Each of the pump houses are provided with the pressure monitoring system to keep the watch on pressure build up inside the pumping mains and also Flow meters to control the required flow.
Pumping Mains

Normally for all TWAD jobs, PRE STRESSED CONCRETE pipes are used for pressure mains used for pumping of water. PSC pipe are classified as per their pressure rating starting from 4 KSC to 18 KSC pressure. The pipes are laid into the excavated trenches with the help of Tri pots or cranes and jointed with help of Rubber ring joints. For negotiating the bends and curves and for fixing the valves, MILD STEEL SPECIALS are fabricated with outside cement guninting and inside cement linning to prevent corrosion.

Branch / Distribution Mains

In order to take water to way side habitations enroute to the pumping main, Branch Pumping mains are laid using either PSC Pipes or AC pipes depending upon the pressure rating requirements. Branch pumping main shoots off from the booster station and takes the water to the way side habitations to the water distribution facility.

In order to distribute the water to the village folks, each habitations to be covered under the purview of the scheme is provided with an elevated level Service reservoirs of capacity ranging from 10,000 litres to 25.00 lakh litre capacity. Further distribution from these Reservoirs are done through PVC pipes networking to public fountains constructed for cluster of habitations at convenient locations.

Surge Protection System

Depending upon the terrain if the system is prone to the surge affect, then suitable surge protection system is designed to counter the same. Normally, ZERO VELOCITY Valves are provided at crucial nodal points based on the detailed surge analysis.

Water Projects for TWAD

2. Tiruthani Water Supply Project.
3. Thirupathur Water Supply Project.

O & M Projects for TWAD

1. Rishivandiym Water Supply Project.
3. Ambur Water Supply Project.
5. Pollachi Water Supply Project.

V. B. Eshwaran
RPM (Water & Utilities), CNRO
ECC, the Engineering, Construction and Contracts Division of Larsen & Toubro Limited (L&T) is India’s largest construction organisation. With over 50 years of experience to its credit, ECC has made a significant contribution to the economic growth and infrastructure development of the country.

**Unaccounted Water**

A pioneer in water supply, treatment and water management systems. ECC is currently executing a major contract for the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) for Leak Detection & Rectification. This special assignment and unprecedented challenge aims at augmenting the Metro water supply through the universally accepted principle of managing the ‘Unaccounted Water’ which is lost in transit.

Out of 400 mld of water supplied per day, 30% - 40% of water is unaccounted in Chennai. Various studies conducted by Metrowater, Chennai revealed loss of water through leakages from damaged or corroded pipes giving rise to multiple problems, such as:

- Loss of precious drinking water
- Pollution of water
- Unhygienic environment
- Decrease in pressure and duration of supply

**Scope**

ECC is helping CMWSSB in this noble task and great mission of ‘Leak Detection and Rectification’ to put an end to this long pending issue. ECC’s scope of work involves:

- Replacement of AC/PVC/corroded CI mains with new CI pipes to the tune of 500 km
- Rectification and replacement of 1.70 lakh house service connections
- Leak testing of 1350 km of distribution mains and restrict the quantum of leak to specified standards (10 litres /connection / hour or 10% - 15 % of total flow)
- Replacement of on-line valves
- Systems approach for carrying out leak detection programme in future, with ease

The work involves day to day consumer contacts to make them aware of the works by way of conducting local meetings, distribution of pamphlets and regular advertisements in the press, in order to gain full co-operation of in-habitants.

**Methodology**

- A pipe locator comprising of a transmitter and a receiver to locate the distribution main of 150 m length, under ground
- After tracing the pipeline route, the main is cut for one metro, for visual inspection for rectification or replacement
- GI pipes are replaced with MDPE pipes for house service connection up to 5 feet inside the property limit, fitted with a stopcock
- CI mains are isolated to a length of 150m by introducing an injection assembly at one end and an isolator assembly on the other end

*A water line amidst criss crossing electrical and communication cables*
After the valves on both terminals are closed and stopcocks shut-off, water is pumped to 1 kg/sq.cm pressure and examined for 30 minutes.

Drop in pressure due to leak in the line is compensated by additional pumping.

A flow meter connected in series with the pulse unit and data logger indicates the quantum of leak.

When the leak exceeds the permissible limit, appropriate measures are taken to trickle down the leak to minimum.

**Advantages**

Leak detection and rectification provides several advantages and cost benefits. Water supply authorities - both in urban and rural areas, Government and Private Water supply bodies can take advantage of this new technology to put an end to the acute water shortage prevailing in the country.

- Minimise loss of precious drinking water
- Avoid contamination of water
- Maintain stable line pressure & improve tail end supply
- Increased consumer satisfaction
- Increase in Revenue to Water Bodies.
- Deferring new investments
- Reduction of power consumption and chemical cost

Many state government have started implementing this ‘unaccounted for water’ scheme after its success in Tamil Nadu.

*Under pressures drilling in progress*

*Gauging rod insertion in progress to measure the I/D*
SCADA SYSTEM
for effective water management at Tirupur Water Supply Project

The main objective of the Tirupur Water Supply Project is to source water from the confluence (intake point) of Cauvery and Bhavani rivers and provide water to industries and domestic users in and around Tirupur. Considered as one of India’s major water supply projects executed on EPC basis including automation, this consists of a 55 km long crosscountry pipeline from Bhavani to the Main Balancing Reservoir (MBR) at Puluwapatti and 300 km of intricate underground water distribution network in Tirupur Township.

This involved construction of 4 major stations along the water trunk pipeline and 36 Water Distribution Stations (WDS) spread across Tirupur for supply of water to the end users. Each WDS caters to either industrial users or domestic users. The water sourcing and distribution network can be seen below.

Main Stations in the Network:
- MBR (Master Balancing Reservoir) - 1 No.
- BPS (Booster Pumping Station) - 1 No.
- WTP (Water Treatment Plant) - 1 No.
- RWI (Raw Water Intake) - 1 No
- FM (Feeder Main) - 3 Nos.
- WDS (Water Distribution Station) - 36 Nos.

** Each FM caters to many WDS

The project covers an area of 100 sq.km. To efficiently manage the entire Water Supply Project, a comprehensive state-of-the-art SCADA (Supervisory Control & Data Acquisition/Automation) System is installed. The system controls and monitors the entire operation by collecting information from various facilities like RWI, BPS, WTP, MBR and WDSs through a centralized Master Control Station on a real time basis. The system can also operate from remote the valves and pumps located at a distance of upto 50 km with click of the mouse at the master control room located at MBR.

ECC’s Electrical, Instrumentation & Communication Business Unit implemented this system for both EPC-I (executed by HCC for water conveying system RWI, WTS, BPS and MBR) and EPC-II (executed by L&T-ECC for water distribution from MBR and all WDS) incorporating some of the latest technical features for the first time in water sector in India. The complete design, detailed engineering, layout specifications for instruments were carried out inhouse. The entire team of Instrumentation Engineers worked in close co-ordination with Mechanical / Civil teams both at HQ and at site with the objective of making this unique, first-of-its-kind project a model for similar systems to come up in future.

Thanks to the advanced systems implemented, the operators are now managing the entire water supply system with ease and efficiency. In order to develop the human-machine interface (HMI graphic screens), we involved the customer during finalisation of the graphic screens to ensure we meet their complete requirements. The installation and commissioning of various
equipment, radio towers/masts, ultrasonic flow meters including the process instruments and SCADA systems were successfully carried out by the site instrumentation team.

**Value Addition / Benefits offered by SCADA System**

- One of the most significant aspect of this system is the reduction in manpower. The company which takes care of O&M for the project has a total of 4 teams of local operators who manage operations of all the 36 WDS locations. The water distribution stations are unmanned and are controlled by respective local remote terminal units (RTUs). In the normal course, each WDS would need minimum 3 operators for 3 shifts a day.

- Ensuring continuous availability of water to local industries and domestic users.
- Pumping of 170 MLD of water from the MBR, on 24x7 basis, benefits nearly 700 industrial users and domestic users under 20 panchayats.
- Energy savings through optimum utilization of pumps/motors by maintaining the levels through the automated system.
- The scope for human error is almost nil, ensuring smooth operation of the system and higher efficiency.
- Diversion of water, as and when required, to a particular WDS is possible from the Master control room.
- Information on cumulative running hours for each of the pumps in each WDS are easily available for the operator to judge and switch over to the respective
standby pumps, optimizing the load on motors and reducing wear and tear/breakdown costs.

- Using this system, pipeline leakages during water transmission can be monitored and plugged with the help of high-end flow meters.

- In case of power failure while pumping water, the SCADA Control room operator can monitor and inform the Electricity Board office to restore power. This reduces the down time of pumps and helps maintain water supply.

- Easy/user-friendly reports are available in the SCADA system which will be useful in drawing up future plans/schedules in line with the demand.

- The Call management software installed in the system receives complaints from the end users. This helps in registering the calls in the system and taking feedback from the respective location after attending to the problem.

### Major Sub-Systems:

Master Control Station at MBR functions with Computer Systems installed with SCADA Software.

The following Communication system are used for Voice and Data:

- **UHF (Ultra High Frequency)** communication system using 2 sets of frequencies
  - For EPC-I 338.16875Mhz and 348.16875 MHz.
  - For EPC-II 338.06875Mhz and 348.06875 MHz.
- Voice communication system between each WDS and MBR has been provided using VHF frequency 160.80 MHz.
• RTU (Remote Terminal Unit) installed at RWI, WTP, BPS, MBR and all WDS.
• Process Parameters monitoring uses ultrasonic flow transmitters, ultrasonic level transmitters, pressure transmitters, level transmitters, chlorine transmitters, turbidity transmitters and pH transmitters.
• Towers and Masts are installed with Radio Antennas/equipment.

Unique features/Highlights of SCADA “Automation” system.

Flexibility in operation of valves and pumps/motors from Master Control Station (automatic or manual) and at WDS (automatic or manual).

Use of DNP 3.0 protocol for data communication between all stations and Master SCADA, ensures time stamping of events at occurrence level.

Automatic operations of WDS by logics implemented within RTU ensures uninterrupted operations even in case of communication failure between Master station and WDS.

Critical data (like tripping of pumps and high levels in reservoirs at RWI, WTP, BPS and MBR locations) were required to be transferred within 15 seconds through UHF communication. By implementing Software Deadband techniques, we are able to transfer data in 5 seconds, ensuring safety of equipment.

Thus, the benefits of latest technological advancements in communication, instrumentation, automation and SCADA systems have been made available to this prestigious water supply project.

Shekhar Murthy
DGM (Instrumentation)
ECC - HQ, Chennai
ECC participated in the AEC World Expo & Conferences organised by Jasubhai Media Pvt Ltd. at MMRDA Grounds, Bandra-Kurla Complex, Mumbai during 14-18 December, 2005.

The exposition showcased innovative trends and materials in the fields of architecture, engineering and construction. ECC’s stall in an area of 224 sq.m. depicted a typical construction site highlighting the various systems of L&T Formwork used for critical and complex projects demanding high speed and quality finish.

Also featured were our RMC plants as well as project execution capabilities in different business segments.

In addition, students of L&T Construction Skills Training Institute, Panvel, demonstrated the masonry skills acquired by them and caught the eyes of many an interested visitor to the expo.

Mr. K.V. Rangaswami, Member of the Board and Senior Vice-President (Operations), L&T participated in the inaugural function of the Expo on the evening of 14\textsuperscript{th} and was felicitated by the organisers.
L&T at GITEX 2005

GITEX 2005, the Middle East’s biggest Information and Communication Technology Exhibition event, was held at the Trade Center Complex in Dubai during 25-29 September, 2005, marking the annual event’s silver jubilee. The Kerala State IT Mission participated in the exhibition by taking up a stall.

At the Kerala Government’s invitation L&T Infocity Limited, Hyderabad joined them with a display of its project “TEJOMAYA”, the proposed first phase of L&T Tech Park Limited (an SPV of L&T Infocity) coming up in Kochi, Kerala.
Recent Advances in Concrete Technology

Mr. A.L. Sekar (ALS) Joint General Manager (System Housing), ECC, HQ made a technical presentation at the inaugural session of a 3-day International conference on “Recent Advances in Concrete and Construction Technology” held at SRM Institute of Science and Technology (Deemed University), Kattankulathur, Chennai during December 7-9, 2005. Dr. A. Ramakrishna was the chief guest. The address was on the topic “Advances in Concrete & Construction Technology” wherein ALS elaborated on the recent advances in the following areas: Structural system, Formwork system, Concrete Technology, Plant & Machinery and Materials. This received wide appreciation from the participants and various dignitaries.

Mr. Md. Khadar Basha, Sr. Design Engineer, EDRC – B&F (IT-Parks), HQ also presented a paper on “Correlation between Accelerated and Normal Compressive Strength of Recycled Aggregate Concrete” in INCRAC & CT-2005, Chennai.

The paper focused on usage of recycled material (demolished concrete) as an environment friendly product. The compressive strength gained by concrete (using recycled aggregate) is more or less the same as offered by normal concrete mixes of same grade using steam-curing process.

One important innovation that has been brought in is a ready reckoner table for site engineers which will help them to calculate the 28 day compressive strength of concrete using steam-curing technique.

Preventive Maintenance and Leak Detection in Water Distribution Systems

Mr. B. Vijayakarthy, Sr. Design Engineer ECC - HQ, Global Engineering Services Unit delivered a guest lecture at the National level refresher course on “Preventive Maintenance and Leak Detection in Water Distribution Systems”.

This was organised by Tamil Nadu Water Supply and Drainage Board (TWAD) at their Training Center in TWAD House, Chennai during October 19-28, 2005.

Mr. Vijayakarthy presented a case study on two topics “Unaccounted for Water” and “Energy Auditing for Water Supply Improvement Schemes”. The study “Unaccounted for Water” focused on the issues related to water auditing in transmission & distribution systems including instruments used, techniques adopted to explore the physical and commercial loss, problems encountered in auditing and measures to reduce water loss.

The second topic “Energy Auditing” focused on the performance study of pumps and electrical equipment used in water supply schemes, energy losses, both commercial & physical, including corrective measures and recommendations for improving the efficiency as well as avenues for increasing revenue to the Operation & Maintenance Departments.

Around 30 Middle & Senior level Engineers belonging to various Govt. departments like TWAD, Chennai Metropolitan Water Supply Sewerage Board (CMWSSB), Municipalities from all over Tamil Nadu and other states attended the presentation on October 20, 2005.
XVII World Safety Congress on Safety and Health at Work

Mr. K.N. Sen, Regional Safety Manager, MBRO participated and made a poster presentation in the “XVII World Safety Congress on Safety and Health at Work” held during September 18-22, 2005 at Orlando, Florida, U.S.A.

His presentation was on “Safety Promotion and Accident Prevention at Construction Sites – Role of Trade Test and Safety Induction”. This technical congress held once in three years was attended by more than 3000 international experts from 110 countries.

Privatization of Road Infrastructure Projects – Focus on Myanmar

Dr. Esther Malini, Manager (Developmental Projects), HQ, an invited speaker, delivered a lecture on “Privatization of Road Infrastructure Projects: Experience in India” at Myanmar Engineering Society, Yangon, Myanmar on October 8th, 2005.

The lecture was well attended by senior engineers of Myanmar including heads of several engineering departments and companies. The talk featured on the immense potential Indian firms had in contributing to infrastructure development in Myanmar, which is in its initial stage.

Flexural Behaviour of Thin Walled, Steel Stiffened Concrete Composite Beams

Ms. R. Kiruthika, a post-graduate engineer training working in ECC’s EDRC (B&F) Business Unit submitted an article on “Flexural Behaviour of Thin Walled, Steel Stiffened Concrete Composite Beams” which was a part of her PG thesis. The same was published in the Institute for Steel Development and Growth (INSDAG) construction journal in the July 2005 issue.

Thin Walled, Steel Stiffened Concrete Composite (TWSSCC) Beams is a new concept that uses cold formed steel sheet with an infill of concrete in which the steel sheet acts as a formwork at the construction stage and later as reinforcement. These beams are simple to fabricate and construct. In order to enhance the bond between steel and concrete, shear connectors and braces are provided at the intervals. These beams offers enhanced confinement. After experimental observation it was confirmed that the load carrying capacity of TWSSCC beams is almost the same as that of reinforced concrete beams.
Mr. R. Inian, Build India Scholarship (BIS) candidate, who is presently posted as Sr. Engineer (Civil) in HIAL site, Hyderabad submitted his thesis paper “Application of particle packing to produce roller compacted concrete” for his M.Tech Project. The same was published in the October 2005 issue of Indian Concrete Journal.

Roller compacted concrete is used in mass concreting applications like dams and pavements due to certain advantages such as use of low cement content, made possible by blending with mineral admixtures like fly ash and adopting innovative placement methods. In this context, particle packing models help in selection of appropriate size and proportions of particulate materials to get suitable combination for optimum packing.

The paper deals with control mixtures of M10 and M20 grade roller compacted concrete as per US Army Corps of Engineers method. These mixtures were then redesigned by replacing cement with fly ash conventionally by conducting trials and also by using software based on a particle packing model. The modified mixtures when compared with control mixtures for strength and durability parameters, were found to have better strength characteristics and superior durability performance than control mixtures and cement replacement mixtures at very low cement content.

The proportion by which cement is to be effectively replaced by fly ash can be determined by particle packing approach, rather than the conventional and time consuming trial mixture procedures.

---

Material Handling Requirement for Cement Factory

Mr. Alok Bhargava, Asst. Manager (Civil), CTS job site, Chennai Region submitted an article on “Material Handling Requirement for Cement Factory Layout: Innovative Approaches” which was published in the July 2005 issue of Indian Engineering Journal, the official journal of The Indian Institution of Industrial Engineering.

---

L&T Sells Glass Unit

Focus on Core Businesses

As part of its on-going drive to sharpen focus on its core businesses in the high technology space, L&T has completed the sale of its glass containers business to Ace Glass Containers Limited of the CK Somani Group, who are also the owners of Hindustan National Glass & Industries Limited, the leading manufacturer of glass containers in India. With the sale of the Glass Container Business, L&T has totally exited from the packaging business. With the transfer of the business as a going concern, all the employees have also been transferred to Ace Glass Containers.

L&T began manufacture of flint glass containers in 1996 at Nashik, Maharashtra. The plant has a manufacturing capacity of 320 MT per day. The plant has an ISO 9001 certification, and primarily serves the requirements of liquor, soft drinks and food industries. The sale of the glass containers business is yet another step taken by the Company, post de-merger of cement in 2003, to enhance value creation in its core businesses comprising Engineering & Construction, High End Manufacturing, Electrical & Electronics, Information Technology and Engineering Services.
Innovative cost saving techniques implemented

Tata Khopoli

Mr. Devandra Kumar, Sr. Engineer and his team at Tata Khopoli site creatively overcame the failure of auxiliary hydraulic pump of BP3000 Schwing concrete pump. They used a non-moving item from the Panvel depot and effected cost savings of Rs. 2.7 lakhs, thus also avoiding a downtime of 8 weeks needed for importing the part.

In appreciation of their resourcefulness and deep commitment to work, the management felicitated the site team.

Satara – Kolhapur Road

Mr. A.K. Sharma, Asst. Manager and his team at Satara – Kolhapur site carried out the following cost effective modifications and earned the appreciation of the management.

- Modification in the wheel disc of Bitelli BB 650 paver by using the available wheel disc of W 20 loader thereby achieving a cost saving of Rs. 6 lakhs and achieving 28000 t of successful paving.
- Worn out track assembly of Arrow Kerb Caster (Model: 750 XL) machine was reused by fitting the available neoprene pads on the old track shoes with necessary modifications effecting cost savings of Rs. 1.3 lakhs and eliminating the downtime of 6-8 weeks for importing the new pads.
- Fabrication of flyash feeding system for Liebherr Batching Plant and commissioning by interfacing with the plant controls for sequential operation with available hardware and software. This initiative brought in cost savings of Rs 22 lakhs in the contractual cost of laying Pavement Quality Concrete (PQC) and Dry Lean Concrete (DLC).
The standing of L&T Construction Skills Training Institute (CSTI), a pioneer in construction workers’ training, has now been re-affirmed by the Government of Tamil Nadu (GoTN) who have initiated a welfare programme called Tamil Nadu Pudhu Vazhvu Project (TNPVP). Launched by the Hon’ble Chief Minister of Tamil Nadu Dr J Jayalalithaa, with funding by the World Bank, the Project aims at the economic uplift of rural poor in the State. TNPVP and CSTI have come together to provide skills training in various trades to rural youth in the age group of 18 to 24 in a phased manner.

The first part of this joint effort was inaugurated on November 23, 2005 by Mr. L.N. Vijayaraghavan, IAS, Secretary, Department of Social Welfare, Government of Tamil Nadu. The first batch of twenty youths (from the districts of Theni, Coimbatore, Vellore, Kancheepuram, Cuddalore and Villupuram) selected under the Project was formally inducted into a three-month course in masonry trade.

Present on the occasion were Mr. N. Muruganandam, Project Director, Tamil Nadu Pudhu Vazhvu Project, Mr. K. Pardhasaradhi, Business Development Specialist, TNPVP, and senior executives of L&T – Mr. G.D. Sharma, Vice President (HR), Mr. S. Natarajan, Head-FCCE and CSTI, and Mr. V.S. Ramana, Head-Corporate Communications. Addressing the trainees in Tamil Mr. Vijayaraghavan explained the objectives of the Pudhu Vazhvu Project and exhorted them to take advantage of the training offered and become skilled craftsmen.

As a prelude to the Project Launch, officials of the World Bank and Tamil Nadu Pudhu Vazhvu Project visited CSTI on November 20, interacted with the inductees and toured the facilities.

The visitors were appreciative of L&T’s efforts for the economic development of the country’s rural youth through imparting construction skills training and complimented the organisation on their keenness to co-operate with the Government in this vital area.

Mr. L.N. Vijayaraghavan, IAS, Secretary, Department of Social Welfare, Government of Tamil Nadu presenting the tools to the student of the first batch of Tamil Nadu Pudhu Vazhvu Project during the inaugural function on November 23, 2005 at CSTI, Chennai
PKVK passes away

Mr. P.K. Venkatakrishnan (PKVK), Vice-President & Head-Power Transmission & Distribution Sector, passed away in the early hours of December 19, 2005 following a massive heart attack. The end came in Abu Dhabi where he was on a business visit. Mr. Venkatakrishnan was 61. He is survived by his wife Mrs. Saraswathy and daughters Shanthi and Sandhya.

Mr. Venkatakrishnan, a graduate electrical engineer from the Kerala University, joined L&T as Junior Engineer on May 24, 1965 and served the organisation with dedication and distinction for over forty years. Under his leadership ECC’s power transmission & distribution business made rapid strides and came to contribute substantially to ECC’s revenues. He spearheaded the consolidation of the Company’s presence in the transmission line tower business in the country and established ECC as a leader in the Gulf countries in this line of business. Between 1999 and 2003 he had a successful stint as head of International Operations.

Ever-smiling, affable and pleasant-mannered, he was widely loved and respected across the L&T organisation, particularly in ECC and EBG. A connoisseur of Indian classical music, he was people-friendly and accessible to one and all. Those who have known him will always remember his charming personality and miss him sorely.

In the passing away of Mr. Venkatakrishnan, L&T has lost a stalwart for whom the Company’s interests were paramount and who knew only to work, work and work, unmindful of the clock ticking away.

ECC Concord pays its respectful homage to Mr. Venkatakrishnan and prays the Almighty to rest his soul in eternal peace and give all his family members the strength to bear this loss.

Photographs of Mr. P.K. Venkatakrishnan taken on different occasions

Top left: Mrs. Venkatakrishnan (extreme left) and PKVK actively participating in the Prayas Trust Annual Day celebrations.
Bottom left: PKVK at the IEEE Power Engineers Meet.
Top right: At the Board meeting of L&T (Oman) LLC, held at ECC Headquarters, Chennai.
Bottom right: Receiving the ISO 9001 Certificate from BVQI Chief for International Operations
New Orders

**Krishnagiri - Thoppurghat Road project in Tamil Nadu**

The Developmental Projects Business Unit of L&T has bagged a BOT project for four laning of Krishnagiri - Thoppurghat section of NH-7 in the state of Tamil Nadu. The order was secured from National Highways Authority of India (NHAI) on BOT route against tough international competitive bidding.

The section, located on the North - South Corridor package in South India, is 62 km long and will be upgraded to a four lane divided road at an estimated investment of about Rs. 525 crore. This crucial link of road is critical in the Salem - Bangalore section of NH-7 as widening of stretches on either side of the link has already been completed. It serves Krishnagiri and Dharmapuri Districts and connects the district headquarters also. The concession offered to L&T is for a period of 20 years, inclusive of the construction period of 30 months. The contract also requires the company to operate and maintain the adjacent four laned sections already completed by NHAI.

The proposed widening, from Krishnagiri will bypass towns like Dharmapuri, Kaveripattanam and Periyampatti enroute Salem. Comprehensive wayside amenity complexes, rest areas, truck laybys, bus bays, etc will be developed along the road as part of the project. The project also includes a major traffic dispersal system by way of grade separated junction improvement at Krishnagiri where NH 46 meets NH 7.


L&T will design, engineer, finance, construct, operate and maintain the road stretch for the period of concession. The project will be domiciled in a separate special purpose vehicle company formed exclusively for the project, and would be developed into a world-class facility using state-of-the-art equipment during both construction and operation.

**Jadcherla - Kottakota Road Project in Andhra Pradesh**

L&T secured yet another BOT contract from NHAI for four laning of NH 7 from Jadcherla - Kottakota in the state of Andhra Pradesh against international competitive bidding. This project is also located in the North South Corridor.

The 56 km road stretch between Jadcherla and Kottakota forms an important link in the Hyderabad-Bangalore corridor of NH 7. The existing two-lane road is to be widened to a divided four-lane road at an estimated investment of Rs 365 crore. This road project has been identified as a priority project as it will improve the connectivity between the two IT hubs of Bangalore and Hyderabad. The concession offered to L&T is for a period of 20 years, including the construction period of 30 months.

The project highway runs through the district of Mahbubnagar in Andhra Pradesh, and the scope includes four laning of the project corridor, construction of five major bridges, one ROB, two flyovers and other wayside amenities. L&T would put in place state-of-the-art Toll Collection Systems and Highway Traffic Management Systems.

L&T will design, engineer, finance, construct, operate and maintain the above road stretches for the period of concession through a special purpose company formed exclusively for the project, and would be developed into a world-class facility using state-of-the-art equipment during both construction and operation.

**Rs. 263 Crore Passenger Terminal building for Hyderabad Airport**

L&T has won an additional order valued at Rs. 263 crores for the construction of the passenger terminal building at the proposed Hyderabad International Airport (HIAL) from China State Construction Engineering (Hong Kong) Limited — main contractors for a part of the airport project package.

The new airport, to be located at Shamshabad, is promoted by the Hyderabad International Airport Limited (HIAL) from China State Construction Engineering (Hong Kong) Limited — main contractors for a part of the airport project package.

The new terminal building, spread across 11.5 lakh square feet, is being built to handle an estimated 5 million passengers per year, and will conform to the standards at major global airports. State-of-the-art facilities include a panoramic canopied hall where visitors and passengers can congregate and
multi-level bays for arrival and departure. The twin wings of the central building will handle international and domestic traffic. Transparent glazing all around the building will provide an aesthetic sheen to the entire structure.

Other high tech construction features include insulated metal profiled curved roofing supported over structural steel truss, and tensile fabric roofing membrane covering 75,000 sq feet of the canopied hall.

Rs. 252 Crore Orders for Electrical Installation and Transmission

A 400-kV switchyard in Himachal Pradesh, a substation in Bhutan, and a 132-km long power transmission line in Chattisgarh are among the slew of orders valued at Rs. 252 crore in the electrical, transmission and distribution sector secured by L&T.

L&T won a Rs. 55 crore order from the National Thermal Power Corporation to set up a 400 kV switchyard in Himachal Pradesh for Koldam Hydro Electric Power Project. The switchyard will be completed in 29 months. At Rajgarh in Chattisgarh, L&T will execute a complete 4 x 250 MW power plant electrification package valued at over Rs. 56 crore for Jindal Power Limited.

The Company continued to make its mark in the international market by securing a Rs. 30.89 crore contract for setting up a 220/66/11 kV substation at Malbase, Bhutan, from Bhutan Power Corporation Limited. The project will be completed in a year. This order follows the 400-kV turnkey switchyard package valued at Rs. 90 crore currently being executed by L&T for the same client.

Major transmission line orders received by L&T from the Power Grid Corporation of India include a Rs. 53.41 crore order for a 132-km long, 400-kV double-circuit line in Chattisgarh and a Rs. 56.55 crore order for a 108-km long 400-kV double-circuit transmission line from Perambalur-Pugalur in Tamil Nadu.

Mabella 132 kV and 33 kV Transmission System

Oman Electricity Transmission Company has awarded L&T (Oman) the ‘Mabella 132 kV and 33 kV Transmission System’ for a value of RO 4.85 million. (Rs.54 cr.). The project is located in Mabella on the outskirts of the capital city Muscat, Sultanate of Oman.

The project consists of one 132 kV/33 kV grid substation and one 33kV/11 kV primary substation and associated 33 kV cabling works, to be completed within a period of 15 months.

The scope of work involves 132 kV Gas Insulated Switchgear, 132 kV /33 kV 125 MVA transformers, 33 kV and 11 kV Switchgears, 33/11 kV 20 MVA transformers, Control Relay panels, 33 kV cabling works and Substation building civil works.

The award of this project further strengthens L&T’s presence in power transmission sector in the Sultanate of Oman. The ongoing projects include the prestigious ‘Sohar Industrial Area Substation’ consisting of Substation civil works, 220/132/33 kV Gas Insulated Switchgears, 220 kV /132 kV 500 MVA Transformers, 132 kV/33 kV 125 MVA Transformers, Substation Control System, Control Relay Panels, 220 kV/132 kV cabling works, which is to be completed within a challenging period of 10 months.

LTO is also executing 31 Km of 33 kV double circuit transmission line from Jahlut S/s to Barr Al Jissah S/s consisting of steel lattice towers, scheduled to be completed this year.

Apart from these, LTO has successfully completed three primary substations (33 kV/11 kV) for the Ministry for Housing, Electricity and Water, and one 132 kV Transmission Line Project this year.
L&T reported Gross Sales of Rs. 3401 crore for the quarter ended September 30, 2005 as against Rs. 3004 crore for the corresponding quarter of the previous year. The Company’s revenues from international operations constituted 21% of the total sales, affirming the Company’s strategy to expand business in the international markets.

During the quarter, the Company divested its stake in L&T-John Deere Private Limited, in line with its strategy to focus on its core businesses. Before considering the profits on divestitures of long term investments, Profit before tax and Profit after tax for the July-September 2005 quarter at Rs. 184 crore and Rs. 120 crore respectively are higher by 26% and 42% respectively, when compared to similar amounts for the corresponding period of the previous year. The higher growth in PBT and PAT as compared to the sales growth has been possible as a result of improvement in the operating margins across all its business segments despite the cost pressures.

L&T ranked 36 among Asian BusinessWeek’s Top 150 in Asia

L&T stands at No.36 in a list drawn up by the Asian BusinessWeek (ABW) of the Top 150 of Asia’s publicly listed companies in its issue dated October 24, 2005. In its first such annual ranking of Asia’s corporates, ABW arrived at the results on the basis of Standard & Poor’s/Citigroup Pan Asia Index as of September 30, 2005. The Pan Asia Index consists of companies in the Primary Market Indexes for the developed and emerging markets of Asia. The primary gauge of performance is growth in sales and earnings for the latest available fiscal year as well as three-year growth in order to reward companies that keep on producing superior growth and profits over a longer term. Apart from L&T fifteen other Indian companies have found a place in the list.
L&T’s Corporate Communications Department at Mumbai and Chennai have together won nine awards at the 45th Annual Awards Competition organised by the Association of Business Communicators of India (ABCI), competing against every major corporate in the country.

Of the nine awards, CCD-ECC bagged three in the categories of Prestige Publication (60 Landmark Years), Wallpaper (Build-India Scholarship) and Photography (Nellore-Sriperumbudur Transmission Line). The awards were presented at Mumbai on October 28, 2005 at a gathering of the country’s leading professional communicators and dignitaries.

For this year’s contest, ABCI received a total of 435 entries in 34 categories of awards under eight main groups: Print Magazines, Annual Reports, Calendars, Brochures, Content, Design, Graphics and Digital Communications,

ABCI, based in Mumbai, is an apex body of business communications professionals. Founded in 1956, its main objectives are to secure recognition for the profession of business communications and contribute to improving business communicator’s professional skills.

<table>
<thead>
<tr>
<th>Category</th>
<th>L&amp;T’s Award Winning Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Communication (External)</td>
<td>Engineering Excellence</td>
</tr>
<tr>
<td>Prestige Publication</td>
<td>ECC booklet: 60 Landmark Years</td>
</tr>
<tr>
<td>Table Calendar</td>
<td>1) Winged Wonder</td>
</tr>
<tr>
<td></td>
<td>2) L&amp;T Medical Desk Calendar 2004</td>
</tr>
<tr>
<td>Tabloids</td>
<td>1) The Edge (EBG)</td>
</tr>
<tr>
<td></td>
<td>2) Powai Pageant</td>
</tr>
<tr>
<td>Wallpaper</td>
<td>Build-India Scholarship wallpaper (ECC)</td>
</tr>
<tr>
<td>Digital Communication (Internal)</td>
<td>Voice Magazine (L&amp;T Infotech)</td>
</tr>
<tr>
<td>Photography</td>
<td>Photo of Nellore-Sriperumbudur Transmission Line in Tamil Nadu (ECC)</td>
</tr>
</tbody>
</table>

Mr. V.S. Natanavelu, Photographer, Corporate Communications Department, ECC receiving the ABCI awards
Greentech's Gold Award for Environmental Excellence

Greentech Foundation, the well-known New Delhi-based non-profit organisation, has conferred on L&T its prestigious Environment Excellence Gold Award 2004-05 in the category of ‘Engineering Sector’.

The award recognises the policies and operations of companies that emphasize environment protection at every step.

The award was presented at a ceremony held in Goa on October 22, 2005, during the 6th “Annual International Conference & Exhibition on Environment Management” organised by the Foundation. Mr. Henry A. Karkada, L&T, received it on behalf of the company from Mr. Francisco Xavier Pacheco, Minister for Agriculture & Animal Husbandry, Government of Goa.

This is the second time that L&T has received this award. In 2003-04, the Foundation picked L&T for the Award in ‘Silver’ category.

IIT’s Distinguished Alumnus Award for Mr. K. Venkataramanan

Mr. K. Venkataramanan (KV), President (Engineering & Construction Projects) and Member of the Board, was presented the ‘Distinguished Alumnus Award’ by the Indian Institute of Technology (IIT), Delhi, for the outstanding contributions made by him as a corporate leader and technologist.

Mr. Venkataramanan received this honour at the 36th Convocation of the Institute. Mr. Venkataramanan received his Bachelor’s degree in Chemical Engineering from IIT Delhi in 1966. He joined L&T as Graduate Engineer Management Trainee.

The IIT’s Distinguished Alumnus Award presentation ceremony was in two parts. On August 12, the Alumnus Association honoured the winners on its own. This function, less formal than the one to follow the next day, allowed prize winners to decide the itinerary. KV, sportsman to the core, decided to add a table tennis match and a lawn tennis match to the events. Battling for points across the nets brought awardees, faculty and students together like nothing else could.

At the formal convocation ceremony on August 13, the glitterati included the celebrated scientist Mr. M.G.K. Menon and the Chief Guest Mr. E. Sreedharan – the man who virtually single-handedly brought the Konkan Railway to reality and is now doing an encore for the Delhi Metro. KV’s achievements were specially cited as being fairly unique. Most IIT-ians either chose the ‘technology’ path or opted for ‘management’. KV achieved success by straddling both streams, and proved that you could gain the best of both worlds.

Mr. K. Venkataramanan (KV), President (Engineering & Construction Projects) and Member of the Board, L&T receiving the ‘Distinguished Alumnus Award’ (IIT, Delhi) from Mr. M.G.K. Menon
Mr. A. M. Naik Honoured with Outstanding Chief Executive Award

Mr. A.M. Naik, Chairman & Managing Director, has been recognized again for professional eminence and inspiring leadership by winning the ‘Outstanding Chief Executive Award’ given by the Indian Institution of Industrial Engineering (IIIE). Mr. Naik received the award at the hands of Mr. Prithviraj Chavan, Union Minister for State, at the inaugural function of the 47th National Convention of IIIE held in Pune on November 11, 2005. IIIE, established in 1957, is a professional body of Industrial Engineers in India, engaged in the promotion of industrial engineering profession in the country.

This is the latest addition to a number of encomiums received by Mr. Naik. Other honours won by him in the recent past include: ‘Management Man of the Year’ Award of the Bombay Management Association (BMA); JRD Tata Corporate Leadership Award from the All India Management Association (AIMA) in New Delhi; Sankara Ratna Award 2004 of Sankara Nethralaya, India’s foremost Medical Research Foundation in eye care services; and Lifetime Achievement Excellence Award for ‘Best Corporate Man of the Decade’ from the New Delhi based Foundation of Indian Industry & Economists.

L&T Wins ‘Learning Culture’ Award

L&T continues to win professional recognition for its unique ethos and a culture that encourages the process of continuous learning. The Company has been chosen for The Economic Times-Indira Group of Institutes Award for ‘Organizations that Create a Learning Culture’. Mr. Y.M. Deosthalee, Member of the Board and Chief Financial Officer, received the award from Mr. Dilip Valse Patil (Minister of State for Education, Energy and Power), at a function in Mumbai on November 21, 2005.

The award presentation was part of a ‘Strategy Summit’ organized by the Indira Group. The award citation noted that L&T’s approach to organizational development has been benchmarked by the industry and would help create an organization that encourages personal mastery in competence building.
The National Institute of Construction Management & Research (NICMAR) and ASAPP Media Information Group, presented the Construction World Awards 2005 on November 30, 2005 at a grand gala function held at Hotel Taj West End, Bangalore. Mr. K.V. Rangaswami, Member of the Board & Senior Vice President (Operations), L&T received the award for Most Admired Company in 2005 including the award for Construction Company with highest turnover and profit.

The function was attended by over 600 invitees, which included corporates, captains of the industry, architects, builders, bureaucrats from the government, ministers and visitors from international companies. Mr. T.N. Chaturvedi, Governor of Karnataka, Mr. Dharam Singh, Chief Minister of Karnataka and Mr. K.H. Muniappa, Minister of State for Shipping, Roads and Transport released the Construction World Annual Number 2005.

The citation for the Most Admired Construction Company 2005 read:

The Engineering Construction & Contracts (ECC) Division of Larsen & Toubro Ltd (L&T) is part of the largest engineering and construction conglomerate in India. It has contributed to the core areas of India’s development and has been instrumental in the country’s most impressive engineering success stories.

Further, it has chalked out strategic initiatives to increase its market base, including owning important plant and machinery, adding more specialist skills to the talent pool, diversifying into O&M in some businesses, and pre-tender value addition with clients and consultants to suit the method of construction.

Quality work, an excellent performance and strong bullish prospects helped Larsen & Toubro notch up the No. 1 position in our Most Admired Companies 2005 perception audit.